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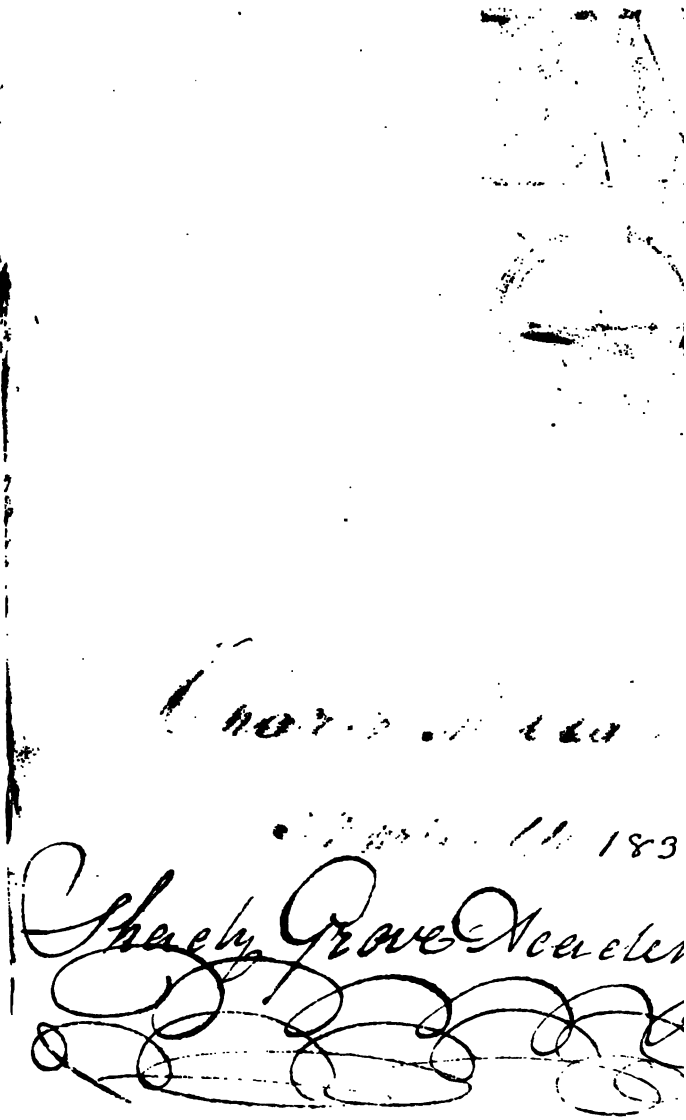

1, Arithmetic - Textbooks, 18?

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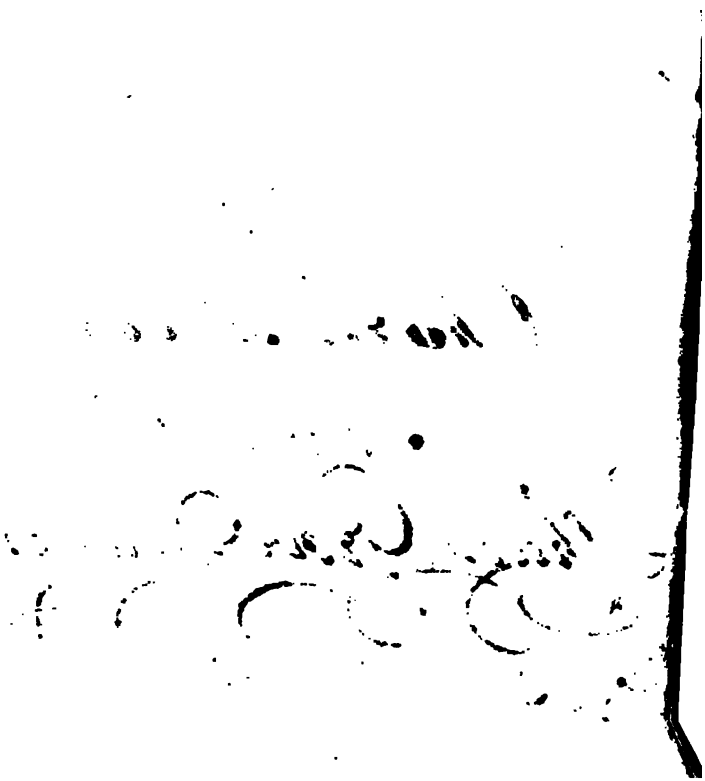
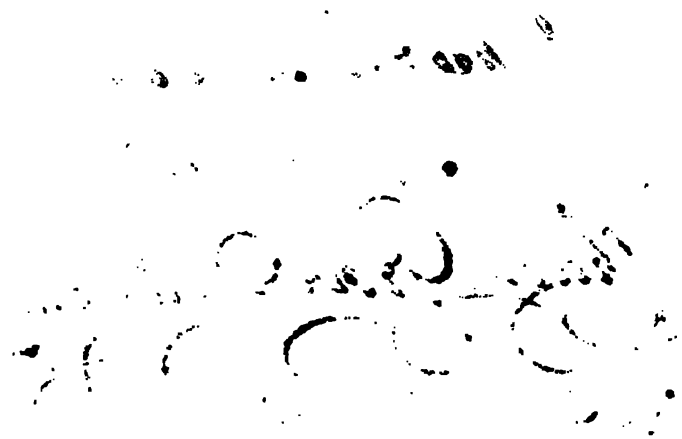


with C. T. Maclay's 1892
Shady Grove
Academy
Class Prize

Grand-father of
Dr. Joseph P. Maclay
Chautauqua
Pa.



12 C. T. Maclay's 1832
Shady Grove
Academy

Grand-father of
Dr. Joseph P. Maclay
Chambersburg
Pa.

A

COMPLETE KEY

TO

SMILEY'S

NEW FEDERAL CALCULATOR,

OR

Scholar's Assistant;

IN WHICH THE

METHOD OF SOLVING ALL THE QUESTIONS CONTAINED IN THAT WORK IS EXHIBITED AT LARGE.

DESIGNED

To facilitate the labour of Teachers, and assist those who have not the advantage of a Tutor's aid.

BY THOMAS T. SMILEY,

TEACHER.

Author of an Easy Introduction to the Study of Geography. Also, of Sacred Geography, for the use of Schools.

PHILADELPHIA:

Published and for sale at J. Grigg's wholesale and retail Book and Stationary Store, No. 9, North Fourth Street.

By W. P. Bason, Charleston (S. C.)

And by Booksellers generally in the United States.

1825.

23558B

Eastern District of Pennsylvania, to wit:

BE IT REMEMBERED, that on the ninth day of May, in the forty-ninth year of the independence of the United States of America, A. D. 1825, John Grigg, of the said district, hath deposited in this office the title of a book, the right whereof he claims as proprietor, in the words following, to wit:

"A Complete Key to Smiley's New Federal Calculator, or Scholar's Assistant; in which the Method of Solving all the Questions contained in that Work is exhibited at large. Designed to facilitate the labour of Teachers, and assist those who have not the advantage of a Tutor's aid. By Thomas T. Smiley, Teacher. Author of An Easy Introduction to the Study of Geography. Also, of Sacred Geography, for the use of Schools."

In conformity to the act of the Congress of the United States, entituled, "An Act for the Encouragement of Learning, by securing the copies of Maps, Charts, and Books, to the authors and proprietors of such copies, during the times therein mentioned"—And also to the act, entitled, "An Act supplementary to an Act, entitled, 'An Act for the Encouragement of Learning, by securing the copies of Maps, Charts, and Books, to the authors and proprietors of such copies during the times therein mentioned,' and extending the benefits thereof to the arts of designing, engraving, and etching historical and other prints."

D. CALDWELL,
Clerk of the Eastern District of Pennsy'vania.

CONTENTS.

EXPLANATION OF CHARACTERS.

Signs.	Significations.
=	Equal; as 20*s.*=£1.
+	Addition, (or more) as 6+2=8.
—	Subtraction (or less) as 8—2=6.
×	Multiplication, (or multiplied by) as 6×2=12.
÷	Division, (or divided by) as 6÷2=3.
: :: :	Proportionally; as 2 : 4 :: 6 : 12.
$\surd$ or $^2\surd$	Square Root; as $^2\surd 64=8$.
$\sqrt[3]{}$	Cube Root; as $\sqrt[3]{64}=4$.
———	A vinculum; denoting the several quantities over which it is drawn, to be considered jointly as a simple quantity.

A KEY

TO

The New Federal Calculator.

SIMPLE ADDITION.

EXAMPLES.

(8)	4829	(9)	91769	(10)	876994
	1234		14678		213678
	6101		80032		482906
	3014		71897		809769
	5618		76989		376980
	20796		335365		2760327
(11)	389261	(12)	2136784	(13)	3769694
	789794		8297698		4976082
	849798		8297694		4569761
	487697		4897695		8213243
	999996		1234697		4876962
	948219		7092032		4876920
	4564765		31956600		31282662
(14)	37856	(15)	378269	(16)	141
	975		402607		5672
	1234		702		82971
	14		1246		34676
	5612		2132		1459
	2075		45178		427
	16287		10276		12
	64053		840410		125358

(17)
14
16
23
29
80
31
100
293

(18)
36
97
125
384
1176
1818

(19)
3797
95
2
75
876
9750
14595

(20)
205
20
840
970
367
1001
3403

(21)
365
807
560
25
37
101
1895

(22)
300
75
2
47
33
9784
20150
765091
1075047
1870529

(23)
75960800
225000
140
76185940

PRACTICAL EXERCISES.

(24)
35
21
56

(25)
275
196
471

(26)
$
30
12
5
$47

(27)
$
50
25
125
216
416

(28)
Miles.
37
33
40
35
145

(29)
Sheep.
A's 34
B's 47
C's 54
135

(30)
25
15
40
9
89

(31)
8
15
19
12
54

(32)
bush. $
400 for 2000
550 2750
950 $4750

MULTIPLICATION.

CASE I.

EXAMPLES.

(8) 3948769768 × 3 = 11846309304

(9) 87051298 × 4 = 348205192

(10) 976201698769 × 5 = 4881008493845

(11) 456978426976 × 6 = 2741870561856

(12) 8079698769 × 7 = 56560891383

(13) 97698429769 × 8 = 781587438152

(14) 28769842369 × 9 = 258928581321

(15) 769829769478 × 10 = 7698297694780

(16) 5697698976845 × 11 = 62634688725295

(17) 7029876956 × 12 = 84358523472

(18) 84976876989 × 12 = 619722523868

(19) 9021681409671 × 12 = 108260176916052

(20) 4218 × 2 = 8436

(21) 7321 × 3 = 21963

(22) 87692 × 4 = 350768

(23) 95698 × 5 = 478490

(24) 10691 × 6 = 64146

(25) 31078 × 7 = 217546

(26) 109019 × 8 = 872152

(27) 900078 × 9 = 8100702

(28) 826870
10
8268700

(29) 278976
11
3068736

(30) 12569769
12
150837228

CASE 2.

EXAMPLES.

(34) 39786948
197
278508636
358082532
39786948
7838928756

(35) 4978829
408
39830632
199153160
2031362232

(36) 8735698
5706
52414188
611498860
43678490
49845892788

(37) 84016978
3761
84016978
504101868
588118846
252050934
315987854258

(38) 49569876
4817
346989132
49569876
396559008
198279504
238778092692

(39) 9637842
9078
77102736
67464894
867405780
8749329676

(40) 9786
13
29358
9786
127218

(41) 8475
29
76275
16950
245775

(42) 11271
35
56355
33813
394485

(43) 19004
305
95020
570120
5796220

(44) 76976
489
692784
615808
307904
37641264

(45) 84769
976
508614
593383
762921
82734544

(46) 1978987
4809
17810883
158318960
7915948
9516948483

(47) 9807094
5047
68649658
39228376
490354700
49496403418

CASE 3.

EXAMPLES.

(48) 37|00
2|00
740000

(49) 4870
25|00
24350
9740
12175000

(50) 4087|00
906|00
24522
367830
370282200000

(51) 876956
99|0000
7892604
7892604
868186440000

CASE 4.

EXAMPLES,

(53) 8976	(54) 7696	(55) 87698	(56) 20784
6	9	9	12
53856	69264	789282	249408
8	9	8	9
430848	623376	6314256	2244672

(57) 81207	(58) 47696	(59) 75687	(60) 34075
11	12	7	6
893277	572352	529809	204450
12	12	8	6
10719324	6868224	4238472	1226700

PRACTICAL EXERCISES.

(61) $25	(62) 15	(63) $250	(64) $150
5	4	7	4
$125	60	$1750	$600

(65) $100	Or thus, 100	(66) 18175
25	5	14
500	500	72700
200	5	18175
$2500	$2500	254450

SUBTRACTION.

EXAMPLES.

(4) 859768 − 124978 = 734790

(5) 9076048 − 7940689 = 1135359

(6) 532147878 − 139876956 = 392270922

(7) 100000 − 84321 = 15679

(8) 75381478 − 39040217 = 36341261

(9) 102070845 − 19768799 = 82302046

(10) 196 − 37 = 159

(11) 487 − 96 = 391

(12) 875 − 302 = 573

(13) 967 − 351 = 616

(14) 1001 − 487 = 514

(15) 9765 − 1307 = 8458

(16) 87696 − 10091 = 77605

(17) 455692 − 300120 = 155572

(18) 1000000 − 1 = 999999

PRACTICAL EXERCISES.

(19) 25 − 8 = 17

(20) 75 − 42 = 33

(21) 7896 − 4389 = 3507

(22) 4875 − 2976 = 1899

(23) 1240 − 1082 = $158

375
567
140
Sum 1082

(24) 5487 − 2075 = 3412

325
750
1000
2075 Sum.

(25) 25 × 9 = 16 containing 250 + 75 + 175

DIVISION.

EXAMPLES OF SHORT DIVISION.

(7) 2)56789768 — 28394884

(8) 3)3829768769 — 1243256256+1

(9) 4)469769876 — 117442469

(10) 5)849768769 — 169953753+4

(11) 6)756976874 — 126162812+2

(12) 7)87694213628 — 12527744804

(13) 8)80269687 — 10033710+7

(14) 9)376948769 — 41883196+5

(15) 11)876956788 — 79723344+4

(16) 12)4976876946782 — 414739745565+2

(17) 12)89769762048769 — 7480813504064+1

(18) 2)3976 — 1988

(19) 3)8769 — 2923

(20) 4)47876 — 11969

(21) 5)8767 — 1753+2

(22) 6)9698 — 1616+2

(23) 7)97899 — 13985+4

(24) 8)80409 — *10051+1*

(25) 9)981021 — 109002+3

(26) 10)897697 — 89769+7

(27) 11)9876978
897907+1

(28) 12)4967844
413987

PRACTICAL EXERCISES.

(29) 2)12
6

(30) 7)350
50

(31) 8)8736
4)1092
273

(32) 3)3966
1322

LONG DIVISION.

EXAMPLES.

(35) 13)875(67
78
95
91
4

(36) 15)476(31
45
26
15
11

(37) 18)958(53
90
58
54
4

(38) 28)1475(52
140
75
56
19

(39) 31)4277(137
31
117
93
247
217
30

(40) 37)25757(696
222
355
333
227
222
5

(41) 41)256976(6267
246
109
82
277
246
316
287
29

(42) 48)337979(7041
336
197
192
59
48
11

(43) 59)997816(16912
59
407
354
538
531
71
59
126
118
8

(44) 98)999987695(1020395
98
199
196
387
294
936
882
549
490
595
588
7

(45) 125)4697680424(37581443
375
947
875
726
625
1018
1000
180
125
554
500
542
500
424
375
49

(46) 396)387690204886(979015668
3564
3129
2772
3570
3564
620
396
2244
1980
2648
2376
2728
2376
3526
3168
358

(47) 876)4876020048769(5566232932
4380
4960
4380
5802
5256
5460
5256
2040
1752
2884
2628
2568
1752
8167
7884
2836
2628
2089
1752
337

(48) 1478)8769826000402(5933576454
7390

13798
13302

4962
4434

5286
4434

8520
7390

11300
10346

9540
8868

6724
5912

8120
7390

7302
5912

1390

(49)

```
87696)98769768720497(1126274501
      87696
      -----
      110737
       87696
       -----
       230416
       175392
       ------
        550248
        526176
        ------
         240727
         175392
         ------
          653352
          613872
          ------
           394800
           350784
           ------
            440164
            438480
            ------
              168497
               87696
               -----
               80801
               -----
```

(50) 97680|0000)8976478976|0000(91896
87912

18527
9768

87598
78144

94549
87912

66377
58608

77696

(51) 1476980|00000)4789768214|00000(3242 Ans.
4430940

3588282
2953960

6343221
5907920

4353014
2953960

Rem. 1399054

PRACTICAL EXERCISES.

(52) 45)9847(218
90
84
45
397
360
Rem. 37

(53) 391)1259678(3221
1173
866
782
847
782
658
391
Rem. 267

(54) 148)225476(1523
148
774
740
347
296
516
444
Rem. 72

(55) 25)375(15 bushels.
25
125
125

(56) 75)87735840(1169811

75

127
75

523
450

735
675

608
600

84
75

90
75

15

(57) 49850)99700(2

99700

When the divisor is the exact product of any two figures multiplied together.

EXAMPLES.

(61) 5)9756

7)1951+1 1st Rem.

278+5 2d Rem.

5

25+1=26

(62) 9)8491

9)943+4

104+7×9+4=67

(63) 9)44767

2)4974+1 Rem.

2487

(64) 7)92017

8)13145+2 Rem.

1643+1×7+2=9

(65) 11)55210

9)5019+1 Rem.

557+6×11+1=67

(66) 6)38751

8)6458+3 Rem.

807+2×6+3=15

(67) 12)99876

9)8323 Rem.

924+7×12=84

(68) 12)37967

12)3163+11 Rem.

263+7×12+11=95

PRACTICAL EXERCISES.

(69) 25)3775(151 Ans.

25

127

125

25

25

Or thus, 5)3775

5)755

Ans. 151 as before.

(70) 96)480(5 lbs. Ans.

480

Or thus, 12)480

8)40

Ans. 5 lbs. as before.

(71) 144)14400(100 Ans.

144

00

Or thus, 12)14400

12)1200

Ans. 100 as before.

(72) 72)1800(25 Ans. Or thus, 12)1800

144

360

360

6)150

Ans. 25 as before.

Ans.

(73) 132)396(3 dols. Or thus, 12)396

396

11)33

Ans. 3 dols. as before.

EXAMPLES IN ADDITION, MULTIPLICATION, SUBTRACTION AND DIVISION.

(1) 50 50 — 100 — 25 sub. — 75 Ans.

(2) 40 10 — 20 10 — 2)20 20 — Ans. 10

(3) 25000 13000 — 2)12000 — $6000

(4) Bought 8200 5000 — 13200 Sold 3756 4879 — 8635 — 8635 — Ans. 4565

(5) 50)2450(49 miles. Ans. 200 — 450 450

(6) Bought 24 bags, containing 3000 lbs.
Sold 15 1736
Remains 9 bags, containing 1264 lbs.

(7) days. 365)2920(8 dols. per day. 2920

Yearly income 2920
Spends yearly 1769

Saves $1151 per year.

COMPOUND ADDITION.

FEDERAL MONEY.

EXAMPLES.

(2)

D.	cts.	m.
46	75	5
79	37	8
43	50	0
97	37	5
$267	00	8

(3)

D.	cts.
37	68¾
95	37½
43	25
79	56¼
$255	87½

(4)

D.	cts.
72	62½
85	87½
20	12½
45	18¾
94	37½
42	68¾
79	18¾
$440	06¼

(5)

D.	cts.
54	75
37	37½
93	18¾
149	87½
503	68¾
979	12½
2194	18¾
$4012	18¾

(6)

D.	cts.
29	25
34	37½
188	68¾
265	12½
1783	18¾
8579	56¼
6	87½
$10887	06¼

(7)

D.	cts.
1	18¾
2	50
	87½
	93¾
1	87½
2	68¾
	37½
	87½
1	93¾
$13	25

	D.	cts.
(8)	5	00
	18	50
	8	87½
	1	18¾
	14	50
	0	87½
	5	37½
	7	87½
	20	00
	$82	18¾

	D.	cts.
(9)	1	87½
	1	68¾
	0	43¾
	1	37½
	0	93¾
	0	56¼
	0	37½
	0	31¼
	0	12½
	$7	68¾

STERLING MONEY.

EXAMPLES.

	£.	s.	d.
(2)	7	9	4½
	13	7	6¾
	4	5	2
	10	18	10¾
Ans.	36	1	0

	£.	s.	d.
(3)	4	6	4
	47	19	7
	159	5	3
	78	6	11¾
Ans.	289	18	1¾

	£.	s.	d.
(6)	763	7	4
	39	4	9
	162	17	2
	459	15	0
	473	12	8
Ans.	1898	16	11

	£.	s.	d.
(7)	69	18	7
	175	2	6
	1582	19	4
	175	13	9
	143	13	8
	212	0	7
Ans.	2359	8	5

	£.	s.	d.
(8)	1776	12	8
	412	16	5
	369	7	2
	469	15	10
	573	19	2
	1987	14	8
	4823	15	11
Ans.	10414	1	10

	£.	s.	d.
(9)	985	4	9
	186	13	4
	1569	18	4
	183	0	8
	0	17	4
	0	0	7
Ans.	2925	15	0

AVOIRDUPOIS WEIGHT.

(3)

	T.	*cwt.*	*qr.*	*lbs.*	*oz.*	*dr.*
	12	16	1	19	15	0
	114	10	2	12	4	13
	72	4	2	24	13	19
	176	15	3	4	15	11
Ans.	376	7	2	6	1	11

(4)

	T.	*cwt.*	*qr.*	*lbs.*	*oz.*	*dr.*
	139	19	3	18	13	10
	1754	10	2	11	2	14
	27	3	0	14	11	0
	0	13	0	0	13	0
Ans.	1922	6	2	17	8	8

TROY WEIGHT.

(3)

	lbs.	*oz.*	*dwts.*	*gr.*
	16	4	18	6
	7	9	11	22
	163	7	12	18
	17	0	13	0
Ans.	204	10	15	22

(4)

	lbs.	*oz.*	*dwts.*	*gr.*
	172	11	19	22
	12	4	13	12
	18	5	11	20
	119	11	13	18
	0	0	2	13
	0	10	0	20
Ans.	324	8	2	9

APOTHECARIES' WEIGHT.

(3)

	℔	℥	ʒ	℈	*gr.*
	18	0	1	0	12
	175	10	5	0	10
	472	3	1	2	3
	0	11	7	2	0
Ans.	667	1	7	2	5

(4)

	℔	℥	ʒ	℈	*gr.*
	182	3	1	0	0
	12	1	0	2	17
	17	2	4	2	15
	0	10	2	1	19
Ans.	212	5	1	1	11

LONG MEASURE.

(3)

	L.	*m.*	*f.*	*p.*	*yd.*	*ft.*	*in.*
	172	2	3	19	2	2	4
	0	0	0	14	1	0	3
	0	1	2	29	0	0	10
	0	0	4	0	0	0	0
	0	0	2	0	0	0	10
	0	0	0	0	3	2	3
Ans.	*173*	*1*	*4*	*23*	*2½*	*0*	*6*

(4)

	L.	*m.*	*f.*	*p.*	*yd.*	*ft.*	*in.*
	462	1	7	29	1	1	10
	0	0	0	11	0	1	10
	4	1	2	28	1	2	9
	0	0	0	13	0	0	0
Ans.	467	0	3	1	4	0	5

LIQUID MEASURE.

		Hhd.	*gal.*
(3)		2	0
		0	29
	Ans.	1	34

(4) From 1 pipe of wine, which is 126 gallons, subtract 93, leaves 33 gallons of wine. Then from 4 hogsheads of brandy, subtract 29 gallons, leaves 223 of brandy. Then from 2 barrels of beer, subtract 1, leaves 1 barrel, which is 31½ gallons. *Answer.*

DRY MEASURE.

		Bu.	*pe.*	*qt.*	*pt.*
(4)		600	2	7	1
		146	3	2	1
	Ans.	453	3	5	0

TIME.

		Y.	*m.*	*d.*
(4)		900	0	0
		111	6	6
	Ans.	788	5	24

		Y.	*m.*	*w.*	*d.*	*h.*
(5)		6	0	0	0	0
		1	1	1	1	1
	Ans.	4	10	2	5	23

MOTION, OR CIRCLE MEASURE.

		Cir.	*sig.*	°	′	″
(4)		11	0	0	7	20
		9	0	0	0	0
	Ans.	2	0	0	7	20

DRY MEASURE.

(3)

	B.	*p.*	*qt.*	*pt.*
	754	2	5	0
	469	0	2	0
	385	2	7	0
	0	0	0	1
	375	0	0	1
	0	3	2	0
Ans.	1985	1	1	0

(4)

	B.	*p.*	*qt.*	*pt.*
	144	3	2	1
	0	1	2	0
	0	0	3	1
	462	3	0	1
	72	0	5	1
Ans.	680	0	6	0

TIME.

(3)

	Y.	*m.*	*w.*	*d.*	*h.*	*m.*	*sec.*
	172	0	1	0	4	0	52
	0	0	0	0	0	34	18
	15	4	0	5	3	27	0
	0	0	1	3	21	35	18
Ans.	187	4	3	2	5	37	28

(4)

	Y.	*m.*	*w.*	*d.*	*h.*	*m.*	*sec.*
	462	4	0	0	5	37	24
	62	0	0	0	11	0	24
	0	0	1	5	0	13	0
	0	6	1	4	13	12	37
Ans.	524	10	3	3	6	3	25

MOTION, OR CIRCLE MEASURE.

(3)

	sig.	°	′	″
	75	10	46	38
	0	11	37	18
	1	0	47	12
	0	0	18	0
	12	0	0	52
	0	75	12	23
	19	11	57	39
Ans.	110	20	40	2

(4)

	sig.	°	′	″
	49	0	45	0
	0	9	0	18
	0	34	27	34
	18	8	13	54
	34	7	12	19
	0	0	47	32
Ans.	103	0	26	37

APPLICATION.

	D.	*cts.*
(1)	375	45
	142	$37\frac{1}{2}$
	1375	$56\frac{1}{4}$
Ans.	1893	$38\frac{3}{4}$

	Y.	*qr.*	*na.*
(2)	57	2	0
	29	3	2
	45	1	0
	32	3	1
	38	2	0
	38	2	0
Ans.	242	1	3

	B.	*p.*	*qt.*
(3)	2	2	0
	3	3	5
	3	1	1
	2	0	4
Ans.	11	3	2

	A.	*R.*	*P.*
(4)	142	2	0
	32	3	12
	108	3	18
Ans.	284	0	30

	Y.	*qr.*	*na.*
(5)	15	3	0
	18	1	2
	25	3	2
Ans.	60	0	0

	M.	*fur.*	*p.*
(6)	43	3	0
	29	0	34
	57	2	32
	12	3	18
Ans.	142	2	4

	Bu.	*p.*	*qt.*
(7)	576	2	0
	854	0	5
	854	0	5
	756	2	0
	756	2	0
Ans.	3977	3	2

COMPOUND MULTIPLICATION.

EXAMPLES.

FEDERAL MONEY.

	D.	*cts.*	*m.*
(1)	25	37	5
			8
Ans.	203	00	0

	D.	*cts.*
(2)	565	$62\frac{1}{2}$
		12
Ans.	6787	50

ENGLISH MONEY.

	£.	s.	d.
(1)	37	6	9½
			5
Ans.	186	13	11½

	£.	s.	d.
(2)	56	8	7¾
			9
Ans.	507	17	9¾

AVOIRDUPOIS WEIGHT.

	Cwt.	qr.	lb.
(4)	1	2	6
			10
Ans.	15	2	4

	Cwt.	qr.	lb.
(5)	4	3	17
			11
Ans.	53	3	19

TROY WEIGHT.

	lbs.	oz.	dwt.	gr.
(5)	41	6	18	2
				7
Ans.	291	0	6	14

	lbs.	oz.	dwt.	gr.
(6)	91	4	14	16
				8
Ans.	731	1	17	8

APOTHECARIES' WEIGHT.

	℔	℥	ʒ	℈
(4)	76	4	1	2
				9
Ans.	687	1	7	0

	℔	℥	ʒ	℈	gr.
(5)	95	1	2	1	11
					11
Ans.	1046	2	3	2	1

LONG MEASURE.

	Deg.	m.	fur.
(4)	6	40	7
			10
Ans.	66	48	6

	M.	fur.	p.
(5)	44	6	20
			7
Ans.	313	5	20

CLOTH MEASURE.

	Yds.	*qr.*	*na.*
(5)	19	2	3
			5
Ans.	96	3	2

	E.E.	*qr.*
(6)	56	3
		9
Ans.	509	2

LAND MEASURE.

	A.	*R.*	*P.*
(4)	1	3	17
			10
Ans.	18	2	30

	A.	*R.*	*P.*
(5)	63	3	18
			11
Ans.	702	1	38

LIQUID MEASURE.

	T.	*h.*	*gal.*	*qt.*
(4)	3	2	50	2
				8
Ans.	29	2	26	0

	H.	*gal.*	*qt.*	*pt.*
(5)	4	41	0	1
				10
Ans.	46	33	1	0

DRY MEASURE.

	B.	*p.*	*qt.*	*pt.*
(4)	44	0	0	1
				7
Ans.	308	0	3	1

	P.	*qt.*
(5)	7	1
		9
Ans.	64	1

TIME.

	Y.	*m.*	*w.*	*d.*
(4)	7	0	4	4
				9
Ans.	63	10	1	1

	Y.	*m.*	*w.*	*d.*
(5)	15	3	0	6
				8
Ans.	122	1	2	6

RULE 2.

EXAMPLES.

(3) Multiply

	D.	*cts.*	*m.*
	66	37	5 by 36
			6×6=36
	398	25	0
			6
Ans.	2389	50	0

(4)

	D.	*cts.*	*m.*
	44	25	3 by 56
			7×8=56
	309	77	1
			8
Ans.	2478	16	8

(5)

	D.	*cts.*
	12	18¾ by 96
		12×8=96
	146	25
		8
Ans.	1170	00

(6)

	£.	*s.*	*d.*
	45	6	9½ by 120
			12×10=120
	544	1	6
			10
Ans.	5440	15	0

(7)

	£.	*s.*	*d.*
	96	12	3¾ by 144
			12×12=144
	1159	7	9
			12
Ans.	13912	13	0

(8)

	A.	*R.*	*P.*
	47	3	20 by 54
			6×9=54
	287	1	0
			9
Ans.	2585	1	0

(9)

	M.	*f.*	*p.*
	48	7	25 by 88
			11×8=88
	538	3	35
			8
Ans.	*4307*	*7*	*0*

(10)

	lb	z	ʒ
	56	8	14 by 84
			12×7=84
	681	9	0
			7
Ans.	4772	3	0

RULE 3.

EXAMPLES.

(2) Multiply

	D.	*cts.*
	7	$87\frac{1}{2}$
		$11\times4+1=45$
	86	$62\frac{1}{2}$
		4
	346	50
	7	$87\frac{1}{2}$
Ans.	354	$37\frac{1}{2}$

(3)

	D.	*cts.*
	28	$68\frac{3}{4}$
		$11\times6+2=68$
	315	$56\frac{1}{4}$
		6
	1893	$37\frac{1}{2}$
	57	$37\frac{1}{2}$
Ans.	1950	75

(4)

	D.	*cts.*
	49	75×3
		12
	597	00
		7
	4179	0
	149	25
Ans.	4328	25

(5)

	D.	*cts.*
	94	$18\frac{3}{4}\times1$
		10
	941	$87\frac{1}{2}$
		3
	2825	$62\frac{1}{2}$
	94	$18\frac{3}{4}$
Ans.	2919	$81\frac{1}{4}$

(6)

	D.	*cts.*
	42	$31\frac{1}{4}\times3$
		11
	465	$43\frac{3}{4}$
		5
	2327	$18\frac{3}{4}$
	126	$93\frac{3}{4}$
Ans.	2454	$12\frac{1}{2}$

(7)

	£.	*s.*	*d.*
	28	7	$6\frac{1}{2}\times1$
			4
	113	10	2
			7
	794	11	2
	28	7	$6\frac{1}{2}$
Ans.	822	18	$8\frac{1}{2}$

(8)

£.	s.	d.	
34	8	4¾	×1
		11	
378	12	4¼	
		6	
2271	14	1½	
34	8	4¾	
Ans. 2306	2	6¼	

(9)

Cwt.	qr.	lbs.	
7	3	22	×1
		10	
79	1	24	
		5	
397	1	8	
7	3	22	
Ans. 405	1	2	

(10)

lbs.	oz.	dwt.	
12	5	8	×3
		12	
149	4	16	
		3	
448	2	8	
37	4	4	
Ans. 485	6	12	

(11)

M.	f.	p.	
4	6	21	×3
		12	
57	6	12	
		7	
404	4	4	
14	3	23	
Ans. 418	7	27	

RULE 4.

EXAMPLES.

(2) Multiply

D.	cts.	
1	56½	×6
	10	
15	65	×5
	10	
156	50	
	4	
626	00	
78	25	
9	39	
Ans. 713	64	

(3)

D.	cts.	
[illegible]		×6
28	75	×7
	10	
287	50	
	5	
1437	50	
201	25	
17	25	
Ans. 1656	00	

REDUCTION.

FEDERAL MONEY.

EXAMPLES.

(1) *D.* 10 × 100 — Ans. 1000

(2) *D.* 25 × 100 — Ans. 2500

(3) *D.* 387 × 100 — Ans. 38700

(4) *cts.* 25 × 4 — Ans. 100 fourths.

(5) *Cts.* 50 × 2 — Ans. 100 halves.

(6) *Cts.* 150 × 3 — Ans. 450 3ds.

(7) *D. cts.* 50 00 × 2 — Ans. 10000 halves.

(8) *D. cts.* 25 00 × 3 — Ans. 7500 3ds.

(9) *D. cts.* 275 00 × 4 — Ans. 110000 qrs.

(10) *D.* 10 × 10 — Ans. 100 dimes.

(11) *D.* 220 × 10 = 2200 dimes. × 10 = 22000 cts. × 10 — Ans. 220000 mills.

Note.—When more than one denomination is given to be reduced.

(8)

D.	*cts.*	*m.*	
10	16	5	×9
		10	
101	65	0	×3
		10	
1016	50	0	
		9	
9148	50	0	
304	95	0	
91	48	5	
Ans. 9544	93	5	

(9)

£.	*s.*	*d.*	
37	18	6¼	×5
		10	
379	5	2½	×7
		10	
3792	12	1	
		3	
11377	16	3	
2654	16	5½	
189	12	7¼	
Ans. 14222	5	3¾	

(10)

£.	*s.*	*d.*	
48	14	2½	×9
		10	
487	2	1	×8
		10	
4871	0	10	
		4	
19484	3	4	
3896	16	8	
438	7	10½	
Ans. 23819	7	10½	

(11)

£.	*s.*	*d.*	
64	2	8	×5
		10	
641	6	6	×5
		10	
6413	6	6	
		5	
32066	13	4	
3206	13	4	
320	13	4	
Ans. 35594	0	0	

(12)

£.	s.	d.	
58	9	$6\frac{3}{4}$	×6
		10	
584	15	$7\frac{1}{2}$	×9
		10	
5847	16	3	
		3	
17543	8	9	
5263	0	$7\frac{1}{2}$	
350	17	$4\frac{1}{2}$	
Ans. 23157	6	9	

(13)

M.	f.	p.	
25	3	18	×5
		10	
254	2	20	×6
		10	
2543	1	0	×2
		10	
25430	10	0	
5086	2	0	
1525	7	0	
127	1	10	
Ans. 32170	4	10	

(14)

F.	in.	b.c.	
48	4	2	×7
		10	
483	10	2	×8
		10	
4838	10	2	×5
		10	
48388	10	2	
		2	
96777	9	1	
24194	5	1	
3871	1	1	
338	8	2	
Ans. 125182	0	2	

(15)

Yd.	qr.	n.	
22	2	1	×4
		10	
225	2	2	
		10	
2256	1	0	×2
		10	
22562	2	0	
		3	
67687	2	0	
4512	2	0	
90	1	0	
Ans. 72290	1	0	

(7)

Qr.	*lb.*	*oz.*
2	25	10
28		
21		
6		
81 lbs.		
16		
486		
82		
1306 ounces.		
16		
7836		
1306		
Ans. 20896 drams.		

APOTHECARIES' WEIGHT.

(2)

oz.
72
8
Ans. 576 drams.

(3)

lb.
10
12
120 ozs.
8
960 drs.
3
2880 scru.
20
Ans. 57600 grs.

(4)

lb.	℥	ℨ	ʒ	℈	*gr.*
15	9	4	2	17	
12					
189 ozs.					
8					
1516 drs.					
3					
4550 scru.					
20					
Ans. 91017 grs.					

	Dol.	*cts.*			£.	*s.*	*d.*			*Dol.*	*cts.*	
)	0	15¼	×6	(8)	0	1	3		(9)	9	10	×5
		10					12				10	
	1	52½			0	15	0			91	0	×6
		10					11				10	
	15	25		Ans.	8	5	0			910	0	
	0	91½									3	
Ans.	16	16½								2730	0	
										546	0	
										45	50	
									Ans.	3321	50	

	£.	*s.*	*d.*			*Dol.*	*cts.*	
(10)	0	9	6 per acre	×5	(11)	1	18¾	×7
		10					10	
	4	15	0	×2		11	87½	×1
		10					10	
	47	10	0			118	75	
		3					2	
	142	10	0			237	50	
	9	10	0			11	87½	
	2	7	6			8	31¼	
Ans.	154	7	6		Ans.	257	68¾	prime cost

(11) *m.* | 5 | ½ | 8462 at 8 *mills.*

2	⅕	4231
1	½	1692 4
		846 2

Ans. $67 69 6

(12) *m.* | 5 | ½ | 1264 at 7 *mills.*

2	⅕	632
		252 8

Ans. $8 84 8

(13) *m.* | 5 | ½ | 4628 at 9 *mills.*

2	⅕	2314
2	⅕	925 6
		925 6

Ans. $41 65 2

CASE 2.

(2) *cts.* | 6¼ | 1/16 | 3648 at 6¼ *cts.*

Ans. $228

(3) *cts.* | 10 | 1/10 | 742 at 10 *cts.*

Ans. $74 20

(4) *cts.* | 20 | ⅕ | 8264 at 20 *cts.*

Ans. $1652 80

(5) *cts.* | 25 | ¼ | 386 at 25 *cts.*

Ans. $96 50

(6) *cts.* | 50 | ½ | 5876 at 50 *cts.*

Ans. $2938

(7) *cts.* | 25 | ¼ | 3542 at 45 *cts.*

20	⅕	885 50
		708 40

Ans. $1593 90

(8)

cts.		
50	½	31925 at 80 *cts.*
25	½	15962 50
5	⅕	7981 25
		1596 25

Ans. $25540 00

(9)

cts.		
12½	⅛	4264 at 12½ *cts.*

Ans. $533

(10)

cts.		
50	½	18626 at 55 *cts.*
5	1/10	9313
		931 30

Ans. $10244 30

(11)

cts.		
25	¼	1724 at 37½ *cts.*
12½	½	431
		215 50

Ans. $646 50

(12)

cts.		
10	1/10	528 at 16 *cts.*
5	½	52 80
1	⅕	26 40
		5 28

Ans. $84 48

(13)

cts.		
50	½	13854 at 56¼ *cts.*
6¼	⅛	6927
		865 87 5

Ans. $7792 87 5

(14)

cts.		
20	⅕	4858 at 29 *cts.*
5	¼	971 60
4	⅕	242 90
		194 32

Ans. $1408 82

(15)

cts.		
50	½	2267 at 85 *cts.*
25	½	1133 50
10	⅕	566 75
		226 70

Ans. $1926 95

(16) *cts.*

20	$\frac{1}{5}$	190 at 20 *cts.*	

Ans. $38

(17) *cts.*

12$\frac{1}{2}$	$\frac{1}{8}$	3654 at 18$\frac{3}{4}$ *cts.*	
6$\frac{1}{4}$	$\frac{1}{2}$	456	75
		228	37·5

Ans. $685 12 5

(18) *cts.*

50	$\frac{1}{2}$	17638 at 70 *cts.*	
10	$\frac{1}{2}$	8819	
10	$\frac{1}{5}$	1763	80
		1763	80

Ans. $12346 60

CASE 3.

(2)

		$	*cts.*	
2	$\frac{1}{2}$	10	25	
			10	
		102	50	
7	$\frac{1}{8}$	5	12	5
		0	64	0

Ans $108 26 5

(3)

		$	*cts.*	
2	$\frac{1}{2}$	4	15	
			7	
		29	05	
1	$\frac{1}{2}$	2	07	5
14	$\frac{1}{2}$	1	03	7
4	$\frac{1}{7}$	0	51	8
1	$\frac{1}{4}$	0	14	8
		0	3	7

Ans. $32 86 5

Cwt. qr. lb. $ *cts.*
) 129 1 10 at 1 05
129

945
210
105

1	¼	13545
7	¼	26 2
2	1/14	6 5
1	½	1 8
		0 9

Ans. $135 80 4

Cwt. qr. $ *cts.*
(5) 16 2 at 5 18
16

2	½	3108
		518
		82 88
		2 59

Ans. $85 47

Cwt. qr. $
) 130 1 at 15
130

1	¼	450
		15
		1950
		3 75

Ans. $1953 75

Cwt. qr. lb. cts.
(7) 25 1 9 at 175
25

1	¼	875
4	1/7	350
4	1/7	43 75
1	¼	43 7
		6 2+
		6 2+
		1 5+

Ans. $44 32 8

qrs. lb. cts.
) 2 14 at 2710

2	½	1355
14	¼	338 7

Ans. $16 93 7

lb. oz. dwt. grs. $ *cts.*
(9) 6 5 10 5 at 4 16
6

4	⅓	
1	¼	2496
10	½	138 6
5	1/8	34 6
		17 3
		3

Ans. $[illegible] 86 8

(10) lbs. oz. dwt. gr. cts.
27 10 4 18 at 2635
27

6	½	18445		
		5270		
3	½	711	45	
1	⅓	13	17	5
4	⅕	6	58	7
12	⅛	2	19	5
6	½		43	9
			5	4
			2	7

Ans. $733 92 7

(11) lbs. oz. dwt. gr. cts.
9 11 17 22 at 613
9

6	½			
4	⅓	5517		
1	¼	306	5	
10	½	204	3	
5	½	51	0	
2	⅕	25	5	
12	¼	12	7	
6	½	5	1	
2	⅓	1	2	
2	⅓		6	
			2	
			2	

Ans. $61 24 3

(12) oz. dwt. gr. cts.
816 13 12 at 12½
816

10	½	1632		
		816		
		408		
		102	00	
2	⅕		6	2
1	½		1	2
12	½			6
				3

Ans. $102 08 3

(13) yds. qrs. $ cts.
27 3 at 9 65
27

2	½	6755		
		1930		
		260	55	
1	½	4	82	5
		2	41	2

Ans. $267 78 7

	yds.	*qr.*	*cts.*
4)	860	1	at 84
			860
1	¼		5040
			672
			722 40
			21
Ans.			$722 61

	yds.	*qr.*	*na.*	*cts.*
(15)	126	2	2	at 475
				126
2	½			2850
				950
				475
				598 50
2	¼			2 37 5
				59 3
Ans.				$601 46 8

	gals.	*qts.*	*cts.*
6)	428	3	at 140
			428
2	½		1120
			280
			560
			599 20
1	½		70
			35
Ans.			$600 25

	gals.	*qts.*	*pt.*	*cts.*
(17)	765	3	1	at 218¾
				4
2	½			875
				765
				4375
				5250
				6125
				6693 75
1	½			4 37
1	½			2 18
				1 09
				4)6701 39
Ans.				$1675 34¾

hhds. gals. $ *cts.*
(18) 5 31½ at 47 12
5

31½ | ½ | 235 60
23 56

Ans. $259 16

hhds gals. qts. $ *cts.*
(19) 17 15 3 at 64 75
17

9 | ¼ | 453 25
647 5

1100 75
3 | ⅓ | 9 25
3 | ⅓ | 3 08 3
3 | ¼ | 3 08 3
77 1

Ans. $1116 93 7

bu. pe. *cts.*
(20) 120 2 at 35
120

2 | ½ | 700
35

4200
17 5

Ans. $42 17 5

bu. pe. qts. $ *cts.*
(21) 780 3 2 at 1 17
780

2 | ½ | 9360
819

912 60
1 | ½ | 58 5
2 | ¼ | 29 2
7 3

Ans. $913 55 0

bu. pe. qts. pt. *cts.*
(22) 1354 1 5 1 at 25
1354

1 | ¼ | 100
125
75
25

338 50
4 | ½ | 6 2½
1 | ¼ | 3 1¼
1 | ½ | 7¾
3¾

Ans. $338 60 5¼

A. R. P. $ *cts.*
(23) 35 2 18 at 54 35
35

2 | ½ | 27175
16305

1902 25
16 | ⅕ | 27 17 5
2 | ⅛ | 5 43 5
67 9

Ans. $1935 53 9

A. R. P.			$ *cts.*
(24) 146	3	10 at	35 10
			146
2	½		21060
			14040
			3510
			5124 60
1	½		17 55
10	¼		8 77 5
			2 19 3+
Ans.			$5153 11 8+

A. R. P.			$ *cts.*
(25) 750	1	4 at	12 25
			750
1	¼		61250
			8575
			9187 50
4	1/10		3 06 2½
			0 30 6¼
Ans.			$9190 86 8¾

APPLICATION.

cwt. qrs. lbs.			$ *cts.*
(1) 84	2	14 at	10 50
			84
2	½		4200
			8400
			882 00
14	¼		5 25
			1 81 2+
Ans.			$888 56 2+

cwt. qr. lbs.			*cts.*
(2) 17	1	7 at	1212½
			2
1	¼		2425 halves.
			17
			16975
			2425
			412 25
7	¼		6 06 1½
			1 51 2¾
			2)419 82 4 mills.
Ans.			$209 91 4 mills.

T. cwt. qrs. $ *cts.*

(3) 15 10 3 at 80 15

15

10	½	40075
		8015
		1202 25
2	½0	40 07 5
1	½	2 00 3¾
		1 00 1¾

Ans. $1245 33 0½

yds. qrs. pie. *yds.*

(4) 35 2×170=6035 at ¼

6035

4)6035 *qrs.*

Ans. $15 08

A. R. P. $ *cts.*

(5) 175 3 12 at 52 15

175

2	½	26075
		36505
		5215
		9126 25
1	½	26 07 5
10	¼	13 03 7
2	⅕	3 25 9
		0 65 1

Ans. $9169 27 2

(6) 1365 at ½*ct.*=$6 82½*cts.* Ans.

(7) 784 at 84 *cts.*

784

336

672

588

Ans. $658 56

STERLING MONEY.

CASE. 1.

(4) $\frac{1}{4}$ | $\frac{1}{4}$ | 475 at $\frac{1}{4}$

12)118$\frac{3}{4}$

Ans. 9*s.* 10$\frac{3}{4}$*d.*

(5) $\frac{1}{2}$ | $\frac{1}{2}$ | 299 at $\frac{1}{2}$

12)149$\frac{1}{2}$

Ans. £12*s.* 5$\frac{1}{2}$*d.*

(6) $\frac{1}{2}$ | $\frac{1}{2}$ | 978 at $\frac{3}{4}$

$\frac{1}{4}$ | $\frac{1}{2}$ | 489

244$\frac{1}{2}$

12)733$\frac{1}{2}$

2|0)61|1 1

Ans. £3 1*s.* 1$\frac{1}{2}$*d.*

CASE 2.

(2) 2 | $\frac{1}{6}$ | 978 at 2*d.*

2|0)16|3

Ans. £8 3*s.*

(3) 4 | $\frac{1}{3}$ | 499 at 5*d.*

1 | $\frac{1}{4}$ | 166 4

41 7

2|0)20|7 11

Ans. £10 7*s.* 11*d.*

(4) 6 | $\frac{1}{8}$ | 792 at 6*d.*

2|0)39|6

Ans. £19 16*s.*

(5) 6 | $\frac{1}{2}$ | 888 at 9*d.*

3 | $\frac{1}{2}$ | 444

222

2|0)66|6

Ans. £33 6*s.*

(6) |6|½|921 at 11*d.*

|3|½|460 6
|2|⅓|230 3
|153 6

2|0)84|4 3

Ans. £42 4*s.* 3*d.*

CASE 3.

(2) |3|¼|487 at 15*d.*

|121 9

2|0)60|89

Ans. £30 8*s.* 9*d.*

(3) |6|½|979 at 22¼

|3|½|489 6
|1|⅓|244 9
|¼|¼| 81 7
| 20 4¾

2|0)181|5 2¾

Ans. £90 15*s.* 2¾*d.*

(4) |6|½|532 at 23¾*d.*

|4|⅓|266
|1|¼|177 4
|½|½| 44 4
|¼|½| 22 2 ½
| 11 1 ¼

2|0)105|2 11¾

Ans. £52 12*s.* 11¾*d.*

CASE 4.

(2) |5|¼|489 at 5*s.*

Ans. £122 5*s.*

$ $ *T. T. hhd. gal. qt. pt.*
(27) As 754 : 1754 :: 1 : 2 1 19 0 1
For 1×1754=1754 which ÷754=2 *T.* 1 *hhd.* 19 *gal.* 0 *qt.* 1 *pt. Ans.*

s. d. £. *s. yds. yds.*
(28) As 18 8 : 36 16 :: 7 : 276.
d. d. yds. yds.
Or, as 224 : 8832 :: 7 : 276.
For 8832×7=61824 which÷224=276 *yds. Ans.*

lb. cwt. qrs. lbs. cts. $ *cts. m.*
(29) As 1 : 5 2 17 :: 9½ : 60 13 5
lb. lbs. cts. $ *cts. m.*
Or, as 1 : 633 :: 9½ : 60 13 5
For 9½×633=6013½ which ÷1=$60 13 *cts.* 5 *m. Ans.*

cts. $ *lb. lbs. oz. dr.*
(30) As 114 : 354 :: 1 : 310 8 6+
For 1×35400=35400 which ÷114=310*lbs.* 8*oz.* 6 *dr. Ans.*

£. *s.* £. *s. skeins. skeins.*
(31) As 2 10 : 105 3 :: 100 : 4206.
s. s. skeins. skeins.
Or, as 50 : 2103 :: 100 : 4206.
For 100×2103=210300 which÷50=4206 *skeins. Ans.*

yds. yd. $ *cts.* $ *cts. m.*
(32) As 39 : 1 :: 350 38 : 8 98 4+
For 35038×1=35038 which ÷39=$8 98*cts.* 4*m. Ans.*

gals. qts. gals. qt. pt. gals. qts. pt.
(33) 61½ *gals.*=61 2+62 1 1=123 3 1.
pt. gals. qts. pt. cts. $ *cts.*
Then as 1 : 123 3 1 :: 37½ : 371 62½.
pt. pts. cts. $ *cts.*
Or, as 1 : 991 :: 37½ : 371 62½.
For 37½+991=37162½ which ÷1=$371 62½ *cts. Ans.*

bu. bu. bu.
(34) 75+87=162.
bu. bu. cts. $ *cts.*
Then as 1 : 162 :: 52 : 84 24.
For 52×162=8424 which ÷1=$84 24 *cts. Ans.*

(35) 1 year equals 365 days.
day. days. cts. $ *cts.*
Then as 1 : 365 :: 187½ : 684 37½.
For 187½×365=68437½ which ÷1=$684 37½ *cts.* the sum he spends in a year; his income yearly is $1022—$684 37½ *cts.*=$337 62½ *cts. Ans.*

cwt. cwt. qrs. lb. $ *cts.* $ *cts.*
(36) As 1 : 4 3 24 :: 2 10 : 10 42½.
lbs. lbs. cts. $ *cts.*
Or, as 112 : 556 :: 210 : 10 42½ price of stove.
For 210×556=110760 which÷112=$10 42½*cts.* price of stove.
Then 27*lbs.*×18¾ *cts.*=$5 06¼ *cts.* amount of pipe, and 50*cts.*×2=$1.00 price of 2 elbows
+$10 42½ *cts.* price of stove.
+$ 5 06¼ *cts.* do. pipe.
+$ 1 00 *cts.* do. elbows.

$16 48¾ *Ans.*

(37) 14 pairs×2=28 single shutters, which×8½=243 whole number of sheets used.
sheet. sheets. cts. $ *cts.*
Then as 1 : 243 :: 11½ : 27 37.
For 243×11½=2737 which÷1=$27 37 *cts. Ans.*

(38) If 45 men eat 1 lb. per day each, they will altogether eat 45 lbs. in a day.
lbs. lbs. d. w. d.
Then as 45 : 4500 :: 1 : 14 2.
For 1×4500=4500 which÷45=100*d.*=14 *weeks* 2 *days. Ans.*

A. R. A. R. P. bu. pe. bu. pe. qts. pt.
(39) As 12 2 : 37 3 5 :: 443 3 : 1341 0 7 1.
P. P. pe. bu. pe. qts. pt.
Or, as 2000 : 6045 :: 1775 : 1341 0 7 1.
For 1775×6045=10729875 which÷2000=1341 *bu.* 0 *pe.* 7 *qts.* 1 *pt. Ans.*

(40)

	$	*cts.*
Amount paid for the sugar	204	00
carriage	15	75
storage	18	31¼
and would gain	57	00
	$295	06¼ the sum the

whole must sell for.

C. qrs. C. $ *cts.* $ *cts. m.*
Then as 27 2 : 1 :: 295 06¼ : 10 72 9+60.
qrs. qrs. cts. $ *cts. m.*
Or, as 110 : 4 :: 29506¼ : 10 72 9+60.
For 29506¼×4=118025 which÷110=$10 72 *cts.* 9 *m.*+60. *Ans.*

(41) To find how much per cent. he can pay.
$ *cts.* $ *cts.* $
As 18284 40 : 9142 20 :: 100 : 50 per cent.
For 100×914220=91422000 which÷1828440=50. *Ans.*
To find what the creditor is to receive.
$ *cts.* $ *cts.* $ $
As 18284 40 : 9142 20 :: 472 : 236.
For 472×914220=431511840 which÷1828440=$236. *Ans.*

INVERSE PROPORTION.

m. m. d. d.
(42) As 12 : 6 :: 18 : 9.
For 18×6=108 which÷12=9 *days. Ans.*

m. m. d. d. h.
(43) As 18 : 12 :: 20 : 13 4.
For 20×12=240 which÷18=13*days* 4*hours. Ans.*

CASE 2.

(2)	$	(3)	£.	s.	d.	£.	s.	d.	
	540		124	5	6	4	19	5	interest for 1 year.
	5				4			3	
	27|00		£4|97	2	0	£14	18	3	Ans.
	2			20					
Ans.	$54|00		s.19|42						
				12					
			d.5|04						

(4)	$	
	482	
	6	
	$28|92	interest for 1 year.
	7	
Ans.	$202|44	

CASE 3.

(2)	$	
	325	
	4	
mo.		
2	13|00	Int. for 1*yr.*
	4	
	52	Int. for 4*yrs.*
	2|16|6	Int. for 2*mo.*
Ans.	$54 16 6	

To find the sum it sold for.

lbs. *lbs.* $ *cts.* $ *cts. m.*

As 112 : 2201 :: 10 65 : 209 29 1+.

For 1065×2201=2344065 which÷112=$209 29 *cts.* 1 *m.* *Ans.*

To find the gain. It sold for $209 29 *cts.* 1 *m.*—$183 00 *cts.* 7 *m.*=$26 28 *cts.* 4 *m.*

yds. yd. $ *cts. cts. m.*

(52) As 47 : 1 :: 14 75 : 31 3+

For 1475×1=1475 which÷47=31 *cts.* 3 *m.*+. *Ans.*

(53) 3 qrs. wide : 1¼ wide :: 3¾ long : 6¾ long.

For 3¾=15 *qrs.* and 1¼=5 *qrs.* therefore 15×5=75 which÷3=25 *qrs.*=the quantity of holland requisite for each suit, and this 25 *qrs.*×354 suits or men=8850 *qrs.* which÷4=2212½ *yds.* *Ans.*

54) First 25 *ft.* : 250 *ft.* :: 33 *ft.* 10 *in.* : 338 *ft.* 4 *in.*

For 33 10×12=406 *in.*×250=101500 which÷25=4060 *in.*=338 *ft.* 4 *in.* the length of the shadow of the tower. Then as the shadow is 18 *ft.* 6 *in.* longer than the width of the river, consequently 338 *ft.* 4 *in.*—18 *ft.* 6 *in.*=319 *ft.* 10 *in.* the width of the river. *Ans.*

55) First, 24 *hrs.* : 1 *m.* :: 360 *deg.* : 17 *m.* 3 *fur.* 1*st* *Ans.*

For 360×69½×1=25020 and 24 *hrs.*×60=1440; therefore 25020÷1440=17 *m.* 3 *fur.*

Again, 24 *hrs.* : 1 *m.* :: 360 *deg.* : 11 *m.* 4 *fur.*=the velocity of the earth in lat. 40 *deg.*

For 360×46=16560÷1440=11 *m.* 4 *fur.*

Then, 17 *m.* 3 *fur.*—11 *m.* 4 *fur.*=5 *m.* 7 *fur.* 2*d* *Ans.*

DOUBLE RULE OF THREE.

EXAMPLES.

(2) Thus 3 *m.* : 8 *m.* } :: 32*A.* : 170*A.* 2*R.* 26*P.* 3*yds.*+
12 *d.* : 24 *d.* }
For 8×24×32=6144 the dividend.
And 3×12=36 the divisor.
Then 6144÷36=170*A.* 2*R.* 26*P.* 3*yds.*+ *Ans.*

(3) Thus 10*ox.* : 20*ox.* } :: 2*A.* : 6*A.*
18*d.* : 27*d.* }
For 20×27×2=1080 the dividend.
And 18×10=180 the divisor.
Then 1080÷180=6*A.* *Ans.*

(4) Thus 9*m.* : 2*m.* } :: 36*lbs.* : 48*lbs.*
10*d.* : 5*d.* }
For 24×5×36=4320 the dividend.
And 9×10=90 the divisor.
Then 4320÷90=48*lbs.* *Ans.*

(5) Thus $100 : $335 } :: $6 : $30 15*cts.*
12*m.* : 18*m.* }
For 335×18×6=36180 the dividend.
And 100×12=1200 the divisor.
Then 36180÷1200=$30 15*cts.* *Ans.*

(6) Thus 20*m.* : 46*m.* } :: $56 31¼*cts.* : $828 92*cts.*
5*d.* : 32*d.* }
For 46×32×5631¼=8289200 the dividend.
And 20×5=100 the divisor.
Then 8289200÷100=$828 92*cts.* *Ans.*

(7) Thus 8*m.* : 12*m.* } :: 120 *pair.* : 540 *pair.*
30*d.* : 90*d.* }
For 12×90×120=129600 the dividend.
And 8×30=240 the divisor.
Then 129600÷240=540. *Ans.*

(8) Thus 12*p.* : 38*p.* } :: 37*lbs.* : 468*lbs.* 10⅔*oz.*
4*d.* : 16*d.* }
For 38×16×37=22496 the dividend.
And 12×4=48 the divisor.
Then 22496÷48=468*lbs.* 10⅔*oz.* *Ans.*

(9) Thus $\left.\begin{matrix} 8li. : 12li. \\ 4E. : 7E. \end{matrix}\right\}$ :: 5*pts.* : 13*pts.*+
For 12×7×5=420 the dividend.
And 8×4=32 the divisor.
Then 420÷32=13+. *Ans.*

(10) Thus $\left.\begin{matrix} 7\frac{1}{2}yds. : 24yds.\ 2qrs. \\ 3qrs. \ : \ 7qrs. \end{matrix}\right\}$ :: $17 37½*cts.* : $132 43*cts.*+
For 24*yds.* 2*qrs.*=98*qrs.* And 7½*yds.*=30*qrs.*
Then 98×7×1737½=1191925 the dividend.
And 30×3=90 the divisor.
Then 1191925÷90=$132 43*cts.*+ *Ans.*

(11) Thus $\left.\begin{matrix} 20h. : 62h. \\ 22d. : 36d. \end{matrix}\right\}$ :: 12*bu.* : 60*bu.* 3*pe.* 3*qts.* 1*pt.*+
For 62×36×12=26784 the dividend.
And 20×22=440 the divisor.
Then 26784÷440=60*bu.* 3*pe.* 3*qts.* 1*pt.*+ *Ans.*

(12) Thus $\left.\begin{matrix} \$100 \ : \$563 \\ 12m. : \ 54m. \end{matrix}\right\}$ :: $6 : $152 01*cts.*
For 563×18×6=182412 the dividend.
And 100×12=1200 the divisor.
Then 182412÷1200=$152 01*cts.* *Ans.*

(13) Thus $\left.\begin{matrix} 8h. \ : 20h. \\ 7m. : 17m. \end{matrix}\right\}$ :: 6*T.* : 36*T.* 8*C.* 2*qrs.* 8*lbs.*
For 20×17×6=2040 the dividend.
And 8×7=56 the divisor.
Then 2040÷56=36*T.* 8*cwt,* 2*qrs.* 8*lbs.* *Ans.*

(14) Thus $\left.\begin{matrix} 2yds. : 50yds. \\ 5qrs. : \ 3qrs. \end{matrix}\right\}$ :: 1*lb.* : 15*lbs.*
For 50×3×1=150 the dividend.
And 2×5=10 the divisor.
Then 150÷10=15*lbs.* *Ans.*

(15) Thus $\left.\begin{matrix} \$21 \ : \$96 \\ 32d. \ : \ 3d. \end{matrix}\right\}$ :: 7*re.* : 3*re.*
For 96×3×7=2016 the dividend.
And 21×32=672 the divisor.
Then 2016÷672=3. *Ans.*

(16) Thus $\left.\begin{matrix} 4m. : & 12m. \\ \$7\frac{1}{2} : & \$9 \end{matrix}\right\} :: \$100 : \$360$

For $12\times9\times100=10800$ the dividend.
And $4\times7\frac{1}{2}=30$ the divisor.
Then $10800\div30=\$360$. *Ans.*

(17) Inversely thus $\left.\begin{matrix} 40ft. \\ 54ft. \\ 72m. \end{matrix}\right\} : \left.\begin{matrix} 20ft. \\ 54ft. \\ 27m. \end{matrix}\right\} :: 10d. : 1d.\ 10\frac{1}{2}hrs.$

For $20\times54\times27\times10=291600$ the dividend.
And $40\times54\times72=155520$ the divisor.
Then $291600\div155520=1d.\ 10\frac{1}{2}hrs.$ *Ans.*

(18) Thus $\left.\begin{matrix} 305m. : & 1056m. \\ 12\frac{1}{2}h. : & 14h. \end{matrix}\right\} :: 30d. : 116d.+$

For $1056\times14\times30=443520$ the dividend.
And $305\times12\frac{1}{2}=3812\frac{1}{2}$ the divisor.
Then $443520\div3812\frac{1}{2}=116d.$ *Ans.*

(19) Thus $\left.\begin{matrix} \$210 & : \$837 \\ 15m. : & 4m. \end{matrix}\right\} :: 24w.\ 3d. : 25w.\ 6d.+$

For $24w.\ 3d.=171d.$ And $837\times4\times171=572508$ the dividend.
And $210\times15=3150$ the divisor.
Then $572508\div3150=181d.=25w.\ 6d.$ *Ans.*

(20) Thus $\left.\begin{matrix} 2\frac{1}{2}yrs. : & 5yrs. \\ \$15 & : \$30 \end{matrix}\right\} :: \$50 : \$200.$

For $5\times30\times50=7500$ the dividend.
And $2\frac{1}{2}\times15=37\frac{1}{2}$ the divisor.
Then $7500\div37\frac{1}{2}=\$200$. *Ans.*

(21) Thus $\left.\begin{matrix} 5m. : & 34m. \\ 4d. : & 90d. \end{matrix}\right\} :: \$20\ 50cts. : \$3136\ 50cts.$

For $34\times90\times2050=6273000$ the dividend.
And $5\times4=20$ the divisor.
Then $6273000\div20=\$3136\ 50cts.$ *Ans.*

(22) Thus $\left.\begin{matrix} 24cwt : & 76cwt. \\ 45m. : & 121m. \end{matrix}\right\} :: \$18 : \$153\ 26cts.+$

For $76\times121\times18=165528$ the dividend.
And $24\times45=1080$ the divisor.
Then $165528\div1080=\$153\ 26cts.$ *Ans.*+

(23) Thus $\left.\begin{matrix}42a. : 385a. \\ 5d. : 15d.\end{matrix}\right\}$ :: 6*m.* : 165*m.*
For 385×15×6=34650 the dividend.
And 42×5=210 the divisor.
Then 34650÷210=165 *Ans.*

PROMISCUOUS EXAMPLES.

(24) Thus $\left.\begin{matrix}35cwt. : 50cwt. \\ 20m. : 150m.\end{matrix}\right\}$ :: $9 50*cts.*:$101 78½*cts.*+
For 50×150×950=7125000 the dividend.
And 35×20=700 the divisor.
Then 7125000÷700=$101 78½*cts.*+ *Ans.*

(25) Thus $\left.\begin{matrix}\$11\ 75cts. : \$31\ 18¾cts. \\ 9m. : 1yr.\ 6m.\end{matrix}\right\}$ :: $125:$663 56¼+
For 3118¾=12475*qrs.*×18*m.*×125=28068750 the dividend.
And $11 75*cts.*=4700*qrs.*×9=42300 the divisor.
Then 28068750÷42300=$663 56¼*cts.*+ *Ans.*

(26) Thus $\left.\begin{matrix}\$100 : \$275 \\ 12m. : 56m.\end{matrix}\right\}$ :: $6 : $77
For 275×56×6=92400 the dividend.
And 100×12=1200 the divisor.
Then 92400÷1200=$77. *Ans.*

(27) Thus $\left.\begin{matrix}\$56 : \$6 \\ 12m. : 20m.\end{matrix}\right\}$ :: $560 : $100
For 6×20×560=67200 the dividend.
And 56×12=672 the divisor.
Then 67200÷672=$100. *Ans.*

(28) Thus $\left.\begin{matrix}12yds. : 75yds. \\ 3qrs. : 5qrs.\end{matrix}\right\}$ :: 5*lbs.* : 52*lbs.*+
For 75×5×5=1875 the dividend.
And 12×3=36 the divisor.
Then 1875÷36=52*lbs.*+ *Ans.*

	$	cts.	
(3)	927	82½	amt.
	834	00	prin.
	$93	82½	int.

As $834 : $93 82½*cts.* :: $100 : $11 25*cts.*
And then, as 2*yrs.* 6*mo.* : $11 25*cts.* :: 1*yr.* : $4½ per cent. Ans.

CASE 7.

	£.	
(2)	1600	2048
	4	1600

£64 00 : 1*yr.* :: 448 : 7*yrs.* Ans.

	$
(3)	1000
	4½
	40 00
	5 00

$45 00 : 1*yr.* :: $281 25*cts.* : 6*yrs.* 3*mo.* Ans.

COMPOUND INTEREST.

	$	
(2)	760	prin.
	6	rate per cent.
	45	60 int. 1st yr.
	805	60 amt. of 1st yr. and prin. for the 2d yr.
	48	33 6 int. of 2d yr.
	853	93 6 amt. of 2d yr. and prin. for the 3d yr.
	51	23 6 int. of 3d yr.
	905	17 2 amt. of 3d yr.
	760	*00 0* 1st prin.

Ans. $145 17 2 compound int.

	£.	s.	d.	£.	s.	d.	
(3)	242	10	6	242	10	6	
			6	14	11	0	int. 1st yr.
	£14	55	3 0	257	1	6	amt.
		20		15	8	5¾	int. 2d yr.
	11	03		272	9	11¾	amt.
				16	7	0	int. 3d yr.
				288	16	11¾	amt.
				17	6	7¼	int. 4th yr.
				306	3	7	amt.
				—242	10	6	1st prin.
			Ans.	63	13	1+	com. int.

	$	
(4)	1300	
	5	
	65|00	int. 1st yr.
	1300	
	1365	amt.
	5	
	68|25	int. for 2d. yr.
	1365	
	1433|25	amt.
	5	
	71|66|2	int. for 3d yr.
	1433|25	

Ans. $1504 91 2*m*. amt.

2355811

	$	$	
(5)	3127	3127	
	4½	140 71 5	int. of the 1st yr.
	12508	3267 71 5	amt.
	1563 5	147 4 7	int. 2d yr.
	$140 71 5	3414 76 2	amt.
		153 66 4	int 3d yr.
		3568 42 6	amt.
		160 57 9	int. 4th yr.
		Ans. $3729 00 5	amt.

PROMISCUOUS EXAMPLES.

	$ *cts.*	£.
(1)	620 25	(2) 420
	5	7
	3101 25	£29 40
	310 12	20
	34 11 37 int. for 1 yr.	*s.*8 00 Ans. £29 £
	5	
Ans.	$170 56 8*m.*	

	$	
(3)	1450	
	60	
	6)87000	
	14500 mills=$14 50*cts.*	Ans.

	£.	s.		£.	s.	d.	
(4)	626	5		626	5	0	
		5¼		32	17	6¾	int. of the 1st yr.
	3131	5		659	2	6¾	amt.
	156	11	3	34	12	1	int. of 2d yr.
	£32|87	16	3	693	14	7¾	amt.
	20			36	8	5	int. of 3d yr.
	s.17|56			730	3	0¾	amt.
	12			—626	5	0	prin.
	d.6|75		Ans.	£103	18	0¾	+ compound int.
	4						
	qrs.3|00						

(5) £. 1659 4

Int. for 1 yr.

£66\|36
20
s.7\|20
12
d.2\|40
4
qr.1\|60

Then as 365 *days* : 21 *days* :: £66 7*s.* 2¼*d.* : £3 16*s.* 4¼*d.* + Ans.

(6)
$$\begin{array}{r} \$ \\ 500 \\ 8 \\ \hline \$40\ 00 \text{ int. for 1 yr.} \end{array}$$

Then as $40 : $500 :: 1*yr.* : 12*yrs.* 6*mo.* Ans.

(7) Thus, 6*yrs.* and 6*mo.* at 2 per cent.=$13 interest on $100.
Then $13+$100=$113=amount of $100.
And as $113 : $250 :: $100 : $221 23*cts.* 9*m.* Ans.

(8)
$$\begin{array}{r} £. \\ 450 \text{ amount.} \\ 300 \text{ principal.} \\ \hline £150 \text{ interest.} \end{array}$$

Then as £300 : £100 :: £150 : £50 which divided by the 5 years=10 per cent. Ans.

INSURANCE, COMMISSION AND BROKAGE.

EXAMPLES.

(2)
$$\begin{array}{r} £. \\ 1320 \\ 5 \\ \hline \text{Ans. } £66|00 \end{array}$$

(3)
$$\begin{array}{r} \$ \\ 3450 \\ 4\frac{1}{2} \\ \hline 13800 \\ 1725 \\ \hline \text{Ans. } \$155|25cts. \end{array}$$

(4)
$$\begin{array}{r|r} \$ & \\ \hline \frac{1}{2} & 1680 \\ & 2\frac{3}{4} \\ \hline & 3360 \\ \frac{1}{2} & 840 \\ & 420 \\ \hline & \$46|20 \text{ commis.} \end{array}$$

$1680—$46 20cts.=$1633|80cts. Ans.

(5)

£.
760
6½
4560
380
£49|40
20
s.8|00

Ans. £49 8*s.*

(6)

	$
½	5630
	7¾
	39410
½	2815
	1407 5

Ans. $436\|32\|5*m.*

(7)

	$
½	17654
	18¾
	141232
	17654
½	8827
	4413 5

Ans. $3310\|12\|5

(8)

£
2150
2

Ans. £43\|00

(9)

	$ *cts.*
½	984 50
	1¼
	984 50
	246 12

Ans. $12\|30\|62

(10)

	$ *cts.*
½	1650 75
	1½
	1650 75
	825 37

Ans. $24\|76\|1

DISCOUNT.

EXAMPLES.

(2) Thus, 2*mo.* at 6 per cent. per an.=$1½ int. of $100
+100

101½ amt. of do.

Then as $101½ : $850 :: $100 : $837 43*cts.* 8*m.*+ Ans.

(3) Thus, 9*mo.* at 6 per cent. per an.=$4½ int. of $100
100

104½ amt. of 100

Then as $104½ : $645 :: $100 : $617 22*cts.* 4*m.* present worth.

645 00 0

Ans. $27 77 6

Yrs.
(4) 4
5

20 int. of $100 for 4 yrs.
100

$120 amt. of do.

Then as $120 : $775 50*cts.* :: $100 : $646 25*cts.* Ans.

(5) 8*mo.* at 6 per cent. per an.=$4 int. of $100
100

$104 amt. of do.

Then $104 : $580 :: $100 : $557 69cts.+ Ans.

Yrs.

(6) 3

$4\frac{1}{2}$

12

$1\frac{1}{2}$

$13\frac{1}{2}$ int. of 100

100

$113\frac{1}{2}$ amt. of do.

Then as $113\frac{1}{2}$: $954 :: $100 : $840 *52cts. 8m.* Ans.

(7) Thus, *15mo.* = $1\frac{1}{4}$*yr.* at *7* per cent. per annum=8\frac{3}{4}$ the discount of 100.

100

108\frac{3}{4}$ amt.

Then 108\frac{3}{4}$: $205 :: $100 : $188 *50cts. 5m.* present worth.

205 0

Ans. $16 49 5

mo. *£.*

(8) 6 $\frac{1}{2}$ 5

3 $\frac{1}{2}$ $2\frac{1}{2}$

$1\frac{1}{4}$

$3\frac{3}{4}$ discount of 100

100

$103\frac{3}{4}$ amt.

Then as 103\frac{3}{4}$: $775 :: $100 : $746 98cts. 7m. Ans.

(9)

mo.	£.
6	½ 6
3	½ 3
1	⅓ 1½
	½

5 dis. of 100 for 10*mo.*

100

$105 amt.

Again

mo.	£.
3	¼ 6
	1 qr.
	6
	1½

15*mo.*

7½ dis. of 100 for

100

107½

$
1005
—475

Rem. 530

Then as 105 : 475 :: 100 ; 452 38. Ans. to first part.
Again 107½ : 530 :: 100 : 493 02 4

Ans. $945 40 4*m.*

(10)

$
2260
6

135 60 int. for 1 yr.
5

$678 00 int. for 5 yrs.

Again

$
6
5

30 dis. of 100
100

$130 amt.

Then $130 : $2260 :: $100 : $1738 46*cts.* 2*m.* pres. wr.
2260 00 0

521 53 8 discount,
678 00 0 interest.

Ans. $156 46 2

(12) £. 782 × 4

£3128 / 20

s.5|60 / 12

d.7|20

Ans. £31 5s. 7d.

(13) $ 476 × 3

Ans. $1428cts.

(14) $ 1385 × 6

83 10 dis.

1385 00

Ans. $1301 90cts.

(15) $ 650 × 4½

2600

325

29|25 discount.

650|00

Ans. $620|75

EQUATION.

EXAMPLES.

(2) $

250×6=1500

250×8=2000

500 — 3500÷500=7mo. Ans.

(3) £.
100×2=200
100×4=400
100×6=600
300 1200÷300=4*mo.* Ans.

$
(4) 100×3= 300
200×5=1000
250×8=2000
550 3300÷550=6*m.* Ans.

BARTER.

EXAMPLES.

(1) Thus 2*cwt.* 2*qrs.* 13*lbs.*=293*lbs.*×9*cts.*=2637*cts.*
Then as 25*cts.* : 2637*cts.* :: 1*lb.* : 105*lbs.* $7\frac{17}{25}$*oz.* Ans.

(2) Thus 2500*lbs*×4½*cts.*=$112 50*cts.*
Then as $1 30*cts.* : $112 50*cts.* :: 1*lb.* : 86*lbs.* 8*oz.*+ Ans.

(3) Thus 108*lbs.*×$1 25*cts.*=$135 00*cts.*
Then as 8¼*cts.* : $135 00*cts.* :: 1*lb.* : 1542*lbs.* 13*oz.*+ Ans.

(4) First, as 1*cwt.* : $3 75*cts.* :: 14*cwt.* 3*qr.* 26*lbs.* : $56 18*cts.* 3*m.* the value of the rice.
Then as $1 87½*cts.* : $56 18*cts.* 3*m.* :: 1*lb.* : 29*lbs.* 15*oz.*+ Ans.

(5) Thus 2*cwt.* 3*qrs.* 17*lbs.*=325*lbs.*×12½*cts.*=$40 62½*cts.*
Then as 37*cts.* : $40 62½*cts.* :: 1*yd.* : 109*yds.* 3*qrs.* Ans.

(6) Thus 357*bu.*×93*cts.*=$332 01*ct.*
Then 45*cts.* : $332 01*ct.* :: 1*bu.* : 737*bu.* 3*pe.*+ Ans.

(7) Thus 15*cwt.* 0*qr.* 27*lbs.* = 1707*lbs.*×20*cts.* = $341 40*cts.*
Then $9 50*cts.* : $341 40*cts.* :: 1*cwt.* : 35*cwt.* 3*qrs.* 20*lbs.*+ Ans.

(8) Thus 95*yds.*×5*pie.*=475*yds.*×23*cts.*=$109 25*cts.*
And 32 *sheep*×250= —80 00

$29 25 rem.

Then as $1 50*cts.* : $29 25*cts.* :: 1*cwt.* : 19*cwt.* 3*qrs.* Ans.

(9) Thus 1286*yds.* at 43*cts.* per *yd.* = $552 98*cts.*
And 2*cwt.* 1*qr.* 13*lbs.*=265*lbs.*×14*cts.*=37 10—

Ans. $515 88

(10) Thus 570*lbs.*×7*cts.*=$39 90*cts.*
Then as 11½*cts.* : $39 90*cts.* :: 1*lb.* : 346*lbs* 15*oz.*+ Ans.

(11) Thus 112*cwt.*×$5 04*cts.*=$564 60*cts.*
Then as 1208*yds.* : $564 60*cts.* :: 1*yd.* : 46*cts.* 7*m.*+ Ans.

(12) Thus 750*lbs.*×$1 08*cts.*=$810 00*cts.*
Then 8*cts.* : $810 00*cts.* :: 1*lb.* : 10125*lbs.* [illegible]*cwt.* 1*qr.* 17*lbs.* Ans.

(13) Thus 2*hhds.*=126*gals.*×75*cts.*=$94 50*cts.*
Then 56*yds.* : $94 50*cts.* :: 1*yd.* : $1 68¾*cts.* Ans.

(14) Thus 2108*lbs.*×10*cts.*=$210 80*cts.*
And $1*doz.*×11½*cts.* = +3 56½

$214 36½ amt. of the whole.
—135 25

$79 11½ rem.

Then as $1 58*cts.* : $79 11½*cts.* :: 1*bu.* : 50*bu.*+ Ans.

(15) Thus 17*cwt.*×4×28=1904*lbs.*×13½*cts.* = $257 04 *cts.* value of A.'s goods.
And 1200*lbs.* at the rate of $14 per cwt.=150 00 balance of B.'s goods.

A. is to receive $107 04

Ans.

(16) Thus 25*cts.*
—20

5 gain on 20*cts.*

Then as 5*cts.* : 20*cts.* :: 5*cts.* : 20*cts.* Ans.

(17) Thus 50*cts.* : 56*cts.* :: 31½*cts.* : 35*cts.* Ans.

(18) Thus 108 *tons* at $10 03 per ton=$1053 15*cts.* value of the iron.

pays cash	650 00
250*lbs.* at 20*cts.* per *lb.*=	50 00
10 loads×15*bu.*×45*cts.*=	67 50
And 85*gals.* at the rate of $75 per *hhd.*=101 19	
	—868 69
	1053 15
Rem. unpaid	$184 46

Then 30*cts.* : $184 46*cts.* :: 1*lb.* : 614*lbs.* nearly. Ans.

LOSS AND GAIN.

EXAMPLES.

(2) Thus 10*cts.*
—8

2

Then 1lb. : 1763*lbs.* :: 2cts. : $35 26*cts.* Ans.

(3) Thus $5 25*cts.*
—5 00

25 gained per barrel.

Then 1*bar.* : 363*bar.* :: 25*cts.* : $90 75*cts.* Ans.

(4) Thus $3 90*cts.*
—3 75

15 gained per yard.

Then 1*yd.* : 150*yds.* :: 15*cts.* : $22 50*cts.* Ans.

(5) First, 1*cwt.* : $7 50*cts.* :: 18*cwt.* 2*qrs.* : $138 75*cts.* the cost.
Then 1*cwt.* : $7 75*cts.* :: 18*cwt.* 2*qrs.* : $143 37½*cts.* sold for.

Ans. gained $4 62½

(6) First, 210 *reams*×$2 62½=$551 25*cts.* the cost.
And 210 *reams*×$2 87½=$603 75*cts.* sold for.

Ans. $52 50 gained.

(7) Thus, sold for $20 75*cts.*
cost 18 12½

gained $2 62½ Ans.

(8) First, 50*cts.*
—45

5

Then 1*bu.* : 150*bu.* :: 5*cts.* : $7 50*cts.* 1st Ans.
Again, 50*cts.* : 5*cts.* :: $100 : $10. 2d Ans.

(9) First, 760*lbs.*×90*cts.*=$684 00 sold for.
810 00 cost.

Lost 126 00 1st Ans.

Then $810 : $126 :: $100 : 15\frac{5}{9}$. Ans.

(10) First, 37½*cts.*
32

5½

Then 37½*cts.* : 5½*cts* :: $100 : 14\frac{2}{7}$ per cent. Ans.

(11) Thus 1*s.* : 2*d.* :: £100 : £16$\frac{2}{3}$ per cent. Ans.

(12) Thus $13 75*cts.*×7*pie.*=$96 25*cts.* first cost.
And $3 12½*cts.*×7*pie.*=$21 87½*cts.* dyeing.

$118 12½ whole cost.

Then $100 : $12 :: $118 12½*cts.* : $14 17½*cts.*
+118 12½

7*pie.*)132 30 for the whole.
$18 90 Ans.

(13) Thus 1*cwt.* : 1*lb.* : : $7 + $3 : 8*cts.* 9*m.* Ans.

(14) Thus, paid 23*cts.* per *lb.*
Sold it for 19

Lost 4*cts.* per *lb.*

Then as 1*lb.* : 702*lbs.* : : 4*cts.* : $28 08*cts.* Ans.

(15) Thus $2 23*cts.* : $2 75*cts.* : : $10 : $12½ per cent. Ans.

(16) Thus $100 : $125 :: $2 10*cts.* : $2 62½*cts.* what 1 box sold for.
Then as $3 50*cts.* price of 1*cwt.* : $2 62½*cts.* price *of 1 box* : : 112*lbs.* : 84*lbs.* Ans.

(17) First, 16*pie.* × $14 = $224 the prime cost.
And 5*pie.* × $17 = $ 85
6*pie.* × $15 = $ 90

$175 received back again.

Then as $100 : $112 :: $224 : $250 88*cts.* price of the whole with rate per cent. added. —175 00

5)75 88 price of the 5 pieces.

Ans. $15 17 6 per *pie.*

(18) Thus $500—$410 = $90 gain on the whole.
Then as 372*lbs* : 1*lb.* :: $90 : 24*cts.* 1*m.*+ Ans.

(19) Thus $1 : $100 :: 5*cts.* : $5 00 the Ans.

(20) Thus, cost $1 05*cts.* per gallon.
Sold for 1 30 per do.

gained 25*cts.* per gallon × 510 = $127 50*cts.* whole gain.

mo. £.
Then |3|½|6 per cent.

1½ the discount for 3*mo.*
100

$101½ amount.

Then as $101½ : $100 :: $127 50*cts.* : $125 61½ *cts.*+ Ans.

FELLOWSHIP.

EXAMPLES.

CASE 1.

(2) Thus

	$
D.'s stock	500
E.'s	400
F.'s	300
Sum	1200

	$	$	$	$	
Then as	1200	: 500 ::	300	: 125	=D.'s
And	1200	: 400 ::	300	: 100	=E.'s
And	1200	: 300 ::	300	: 75	=F.'s

} Ans.

(3) Thus

	$
A.	1200
B.	500
C.	700
Whole debt	2400

	$	$	$	$	
Then as	2400	: 1200 ::	1800	: 900	A.'s
as	2400	: 500 ::	1800	: 375	B.'s
as	2400	: 700 ::	1800	: 525	C.'s

} Ans.

$1800 proof.

(4) Thus

	cattle.
A. had	50
B.	80
C.	70
Sum	200

	cattle.	*cattle.*	$	$	
Then as	200	: 50 ::	60	: 15	A.'s
as	200	: 80 ::	60	: 24	B.'s
as	200	: 70 ::	60	: 21	C.'s

} Ans.

$60 proof.

(5) Thus, to

	$	
A.	120	
B.	250	75
C.	300	
D.	208	25
Sum	879	00

Then As $879 : $650

	$		$		
::	120	:	88	75+	=A.'s sh.
::	250 75	:	185	42+	=B.'s sh.
::	300	:	221	84+	=C.'s sh.
::	208 25	:	153	99+	=D.'s sh.

} Ans.

(6) Thus A. is to have 1 portion.
B. 2
C. 6

9 sum of the portions.

Then as

p.	*p.*		$		$	
9	: 1	::	900	:	100	=A.'s share.
9	: 2	::	900	:	200	=B.'s share.
9	: 6	::	900	:	600	=C.'s share.

} Ans.

(7) Thus, he owes to

	$	
A.	250	50
B.	500	00
C.	349	50
Sum	1100	00

Then As 1100 : 960 ::

$	*cts.*		$	*cts.*	*m.*	
250	50	:	218	61	8+	A.'s
500	00	:	436	36	3+	B.'s
349	50	:	305	01	8+	C.'s

} Ans.

EXAMPLES.

CASE. 2.

(1) Thus
$$\begin{array}{r} \$ \\ 88\times3 = 264 \\ 120\times4 = 480 \\ 300\times6 = 1800 \\ \hline \text{Sum of stocks and time } 2544 \end{array}$$

Then as
$$\begin{array}{rcrcrl} \$ & & \$ & & \$\ cts.\ m. & \\ 264 & :: & 184 & : & 19\ 09\ 4 & =\text{L.'s} \\ 480 & :: & 184 & : & 34\ 71\ 6 & =\text{M.'s} \\ 1800 & :: & 184 & : & 130\ 18\ 8 & =\text{N.'s} \end{array}\Big\}\ \text{Ans.}$$
$\$2544$:

(2) Thus
$$\begin{array}{r} \$ \\ 580\times12 = 6960 \\ 100\times9 = 900 \\ \hline \text{A.'s stock and time } 7860 \end{array}$$

Then
$$\begin{array}{r} \$ \\ 1000\times12 = 12000 \\ 200\times3 = 600 \\ \hline \text{B.'s stock and time} = 12600 \end{array}$$

$$\begin{array}{r} \text{And } \$486\times3 = 1458 \\ -300 \\ \hline 186\times2 = 372 \\ +500 \\ \hline 686\times3 = 2058 \\ -400 \\ \hline 286\times1 = 286 \\ +1000 \\ \hline 1286\times3 = 3758 \\ \hline \text{C.'s stock and time } 7932 \end{array}$$

$$\begin{array}{r} \text{Then A.'s } 7860 \\ +\text{B.'s } 12600 \\ +\text{C.'s } 7932 \\ \hline \text{Sum of stocks } 28392 \end{array}$$

Then 28392 :
$$\begin{array}{rcrcrl} \$ & & cts. & & & \\ 7860 & :: & 2108\ 44 & : & 583\ 69 & +\text{A.'s sh.} \\ 12600 & :: & 2108\ 44 & : & 935\ 69 & +\text{B.'s sh.} \\ 7932 & :: & 2108\ 44 & : & 589\ 04 & +\text{C.'s sh.} \end{array}\Big\}\ \text{Ans.}$$

EXCHANGE.

DOMESTIC EXCHANGE.

(1) Thus £63 14*s.* 6*d.*=15294*d.*÷72*d.* a doll. in Virginia=$212 41½*cts.* Ans.

(2) Thus £230 10*s.* 7*d.*=55327*d.*÷96*d.* a doll. in New York and N. Carolina=$576 32*cts.* 2*m.* Ans.

(3) Thus

$
150

90*d.*=a doll. Penn. cur.

12)13500*d.*

2|0)112|5

£56 5*s.* Ans.

(4) Thus

$	*cts.*
377	40

72*d.*=a doll. Mass. cur.

754 80
26418 0

12)27172 80

2|0)226|4 4*d.*

£113 4*s.* 4*d.* Ans.

(5) Thus

$	*cts.*
389	45

56*d.*=a doll. in Georgia.

233670
194725

12)21809|20

2|0)181|7 5

£90 17*s.* 5*d.*

FOREIGN EXCHANGE.

EXAMPLES.

(2) Thus £1 : £76 :: $4 10*cts.*=£1 Irish : $311 60 *cts.* Ans.

(3) Thus $1 24*cts.*=1 milrea : $532 32*cts.* :: 1*m.* : 429*m.* 298 *reas*+. Ans.

(4) Thus 66*cts.* : $1869 :: 1*ru.* : 2831$\frac{9}{11}$*ru.* Ans.

(5) Thus 1*g.* : 165*g.* :: 39*cts.* : $64 35*cts.* Ans.

(6) Thus 33*cts.* 5*m.*=1 *m. b.* : $280 58*cts.* 5*m.* :: 1 *m. b.* : 837 *m. b.*+ Ans.

(7) Thus 1*li.* : 562*li.* :: 18*cts.* 5*m.*=1*li.* : $103 97*cts.* Ans.

(8) Thus 10*cts.*=1 *rial plate* : $463 :: 1*rial* : 4630*rials.* Ans.

(9) Thus 1*flo.* : 40*cts.* :: 591*flo.* 17*st.* : $236 74*cts.*
Or 1*st.* : 2*cts.* :: 591*flo.* 17*st.* : $236 74*cts.*
Then $100 : $160 :: $236 74*cts.* : $378 78*cts.*+ Ans.

(10) Thus as 100*cr.*+25 : 100*b.* :: 2464 *m. b.* : 1971 *m. b.* 3*sch.* 2$\frac{2}{5}$*pen.* Ans.

(11) Thus 1*cr.* : 32½*d.* :: 2000*cr.* : £270 16*s.* 8*d.* Ans.

(12) Thus as 1*pi.*=8*ri.* ; 36*d.* :: $1676 6*ri.*=16766*ri.* : £314. 7*s.* 3*d.* Ans.

(13) Thus 1*pez.*=20*sol.* : 54*d.* :: 3940*pez.* 15*sol.* : £886 5*s.* 0½*d.*. Ans.

(14) Thus 1*ru.* : 4*s.* 3*d.* :: 2586*ru.* : £549 10*s.* 6*d.* Ans.

(15) First £1 : 34*s.* 6*d.* :: £450 15*s.* : £777 10*s.* 10*d.*= first exchange.
Then as 50*sti.*=90*d.* : 1*ru.* :: £777 10*s.* 10*d.* : 2073 *ru.* 44$\frac{4}{9}$*cop.* Ans.

(16) Thus as £108 6*s.* 8*d.* Irish : £100 *str.* :: £813 3*s.* 6*d.* : £750 12*s.* 6*d.* Irish. Ans.

(17) First 20*s.* : 33*s.* 6*d.* : : 5*s.* : 8*s.* $4\frac{1}{2}d.$
Then 5*s.* : 8*s.* $4\frac{1}{2}d.$: : $32\frac{1}{2}d.$: $54\frac{7}{16}d.$ Flemish. Ans.

(18) Thus $32\frac{1}{2}d.$: $54\frac{7}{16}d.$: : 5*s.* : 8*s.* $4\frac{1}{2}d.$
Then as 5*s.* : 8*s.* $4\frac{1}{2}d.$: : 20*s.* : 33*s.* 6*d.* Ans.

(19) Thus

s.	*s.*	*d.*
5	$\frac{1}{2}$	33 6

8 $4\frac{1}{2}$=value of a crown at that rate.
Then 8*s.* $4\frac{1}{2}d.$: 5*s.* : : $54\frac{7}{16}d.$: $32\frac{1}{2}d.$ Ans.

(20) Thus $32\frac{1}{2}d.$: 32*d.* : : 36*s.* 6*d.* : 36*s.* $2\frac{26}{43}d.$ Ans.

(21) Thus 51*d.* : 53*d.* : : 42*d.* : $43\frac{30}{51}d.$ Ans.

VULGAR FRACTIONS.

REDUCTION OF VULGAR FRACTIONS.

EXAMPLES.

CASE 1.

(2) Numer. 108)144(1
108

Common measure 36)108(3
108

Then $36)\frac{108}{144}=\frac{3}{4}$ Ans.

(4) Numer. 126)234(1
126

108)126(1
108

Common measure 18)108(6
108

Then $18)\frac{126}{234}=\frac{7}{13}$. Ans.

CASE 2.

(2) $45\times3+2=1\frac{3}{3}7$. Ans.

(3) Thus $1564\times5+3=7\frac{8}{5}2\frac{3}{5}3$. Ans.

CASE. 3.

(2) Thus $67\div7=9\frac{4}{7}$. Ans.

(3) Thus 16)364(22$\frac{12}{16}$. Ans.

32

44

32

12

CASE 4.

(2) Thus $6\times8\times11\times13=6864$ numer.
And $7\times9\times12\times17=\overline{12852}$ denom. $=\frac{572}{1071}$ Ans.

(3) Thus $7\times15\times8\times6=5040$ numer.
And $12\times19\times11\times13=\overline{32604}$ denom. $=\frac{420}{2717}$ Ans.

CASE 5.

(2) Thus 5)5 20 10 15 the denominators.

2)1 4 2 3

1 2 1 3

Then $5\times2\times1\times2\times1\times3=60$ common denom.
Then the com. denom. $60\div5=12\times4=48$
$60\div20=3\times9=27$
$60\div10=6\times7=42$
$60\div15=4\times4=16$ } numer.
That is $\frac{48}{60}$ $\frac{27}{60}$ $\frac{42}{60}$ $\frac{16}{60}$. Ans.

(3) Thus 2)10 2 9 the denom.

5 1 9

Then $2\times5\times1\times9=90$ common denom.

$90\div10=\ 9\times9=81$
$90\div\ 2=45\times1=45$ } numer.
$90\div\ 9=10\times5=50$

That is $\frac{81}{90}$ $\frac{45}{90}$ $\frac{50}{90}$. Ans.

CASE 6.

(2) First 1*lb.* troy$=240$*dwt.* therefore $\frac{3}{5}$ of $\frac{1}{240}=\frac{3}{1200}=\frac{1}{400}$*lb.* Ans.

(3) Thus $3\times1\times1$
And $8\times4\times4=\frac{3}{128}$. Ans.

(4) Thus 1*hhd.*$=504$*pts.* therefore $\frac{5}{8}$ of $\frac{1}{504}=\frac{5}{4032}$*hhd.* Ans.

(5) Thus 8*fur.*$=1$*m.* therefore $9\times1=9$ the numer. and $16\times8=128$ the denom.$=\frac{9}{128}$. Ans.

CASE 7.

(2) Thus $2\times112=224$ the numer. and $252\times1=252$ the denom.$=\frac{224}{252}=\frac{8}{9}$*lb.* Ans.

(3) $\frac{6}{1680}$ of £1$=\frac{6}{1680}$ of $\frac{241}{1}=\frac{1449}{1680}=\frac{6}{7}$*d.* Ans.

(4) $\frac{4}{112}$ of 1*yd.*$=\frac{4}{112}$ of $\frac{16}{1}=\frac{64}{112}=\frac{4}{7}$*na.* Ans.

CASE. 8.

(2) Thus $\frac{7}{8}$ of a shilling$=\frac{7}{8}$ of $\frac{12}{1}=\frac{84}{8}=10\frac{1}{2}$*d.* Ans.

(3) Thus $\frac{12}{48}$ of a day$=\frac{12}{48}$ of $\frac{24}{1}=\frac{288}{48}=6$*hrs.* Ans.

(4) Thus $\frac{5}{16}$ of an acre$=\frac{5}{16}$ of $\frac{4}{1}$ of $\frac{40}{1}=\frac{800}{16}$ perches$=$ 1*r.* 10*p.* Ans.

CASE 9.

(2) Thus 5*s.* 4*d.*$=64$*d.* and £1$=240$d. therefore $\frac{64}{240}=\frac{4}{15}$£. Ans.

(3) Thus 6*mo.* 2*w.*=26*w.* and 1*yr.*=52*w.* therefore $\frac{2}{52}$ of 1*yr.*=$\frac{1}{26}$*yr.* Ans.

(4) Thus 2*qrs.* 3*na.*=11*na.* and 1*yd.*=16*na.* therefore $\frac{11}{16}$*yd.* is the Ans.

ADDITION OF VULGAR FRACTIONS.

EXAMPLES.

(2) Thus $\frac{3}{13}+\frac{4}{13}+\frac{5}{13}+\frac{1}{13}=\frac{13}{13}=1$. Ans.

(3) Thus $\frac{4}{7}+\frac{3}{7}+\frac{6}{7}=\frac{13}{7}=1\frac{6}{7}$. Ans.

(4) Thus $\left.\begin{matrix}2\times10=20\\5\times\ 5=25\end{matrix}\right\}$ numer.
And $5\times10=50$ the common denom.
Then $\frac{20}{50}+\frac{25}{50}=\frac{45}{50}=\frac{9}{10}$. Ans.

(5) Thus $3\frac{1}{4}$ reduced to an improper frac.=$\frac{13}{4}$
And $8\frac{2}{7}$ do. do. do. =$\frac{58}{7}$
Then we have $\frac{13}{4}$ $\frac{58}{7}$ $\frac{4}{9}$ therefore
$\left.\begin{matrix}13\times7\times9=\ 819\\58\times4\times9=2088\\4\times7\times4=\ 112\end{matrix}\right\}$ numerators.
And $4\times7\times9=252$ common denom.
Therefore $\frac{819}{252}+\frac{2098}{252}+\frac{112}{252}=\frac{3019}{252}=11\frac{247}{252}$. Ans.

(6) Thus $\frac{3}{8}$ of $\frac{5}{8}=\frac{15}{48}=\frac{5}{16}$.
And $\frac{2}{13}$ of $\frac{7}{12}=\frac{14}{156}=\frac{7}{78}$. Then we have $\frac{5}{16}$ $\frac{7}{78}$.
Therefore $\left.\begin{matrix}5\times24=120\\7\times16=112\end{matrix}\right\}$ numer.
And $16\times24=384$ common denom.
Then $\frac{120}{384}+\frac{112}{384}=\frac{232}{384}=\frac{29}{48}$. Ans.

(7) Thus $\frac{1}{3}$ of an acre=$\frac{1}{3}$ of $\frac{4}{1}=\frac{4}{3}$.
Then we have $\frac{4}{3}$ $\frac{7}{10}$.
Therefore $\left.\begin{matrix}4\times10=40\\7\times\ 3=21\end{matrix}\right\}$ numerators.
And $3\times10=30$ common denom.
$\frac{40}{30}+\frac{21}{30}=\frac{61}{30}r.=2\frac{1}{30}r.=2r.\ 1\frac{1}{2}p.$ Ans.

MULTIPLICATION OF VULGAR FRACTIONS.

EXAMPLES.

(2) $\frac{2}{10}$ by $\frac{1}{3}$ thus $2\times1=2$, $10\times3=30$ $=\frac{1}{15}$ Ans.

(3) Thus $6\frac{2}{4}=\frac{26}{4}$ by $\frac{1}{7}=26\times1=26$, $4\times7=28$ $=\frac{13}{14}$ Ans.

(4) $4\frac{3}{4}=\frac{19}{4}$ by $\frac{2}{3}=19\times2=38$, $4\times3=12$ $=3\frac{2}{12}=3\frac{1}{6}$ Ans.

SUBTRACTION OF VULGAR FRACTIONS.

EXAMPLES.

(2) Thus $\frac{1}{4}$ of $\frac{1}{4}=\frac{1}{28}$. Then we have $\frac{19}{20}-\frac{1}{28}$.
Therefore $19\times28=532$, $1\times20=20$ } numer.
And $20\times28=560$ common denom.
Then $\frac{532}{560}-\frac{20}{560}=\frac{512}{560}$. Ans.

(3) Thus $5\times14=70$, $6\times1\times6$ } numer.
And $1\times14=14$ common denom.
Therefore $\frac{70}{14}-\frac{6}{14}=\frac{64}{14}=4\frac{8}{14}$. Ans.

(4) Thus $\frac{2}{3}$ of a league $=\frac{2}{3}$ of 3 miles $=2$ miles.
And $\frac{7}{10}$ of a mile $=\frac{7}{10}$ of 8 furlongs $=\frac{56}{10}=5\frac{6}{10}$ furlongs $=5$ furlongs 24 poles.
Therefore 2*m.*—5*fur.* 24*po.*=1*m.* 2*fur.* 16*po.* Ans.

(5) $5\frac{3}{4}=\frac{23}{4}$ and $2\frac{2}{3}=\frac{8}{3}$ and these reduced to a common denom. $=23\times3=69$, $8\times4=32$ } numer.
And $4\times3=12$ common denom.
Therefore $\frac{69}{12}-\frac{32}{12}=\frac{37}{12}=3\frac{1}{12}$. Ans.

(6) Thus $\frac{7}{16}=\frac{14}{8}$ and $\frac{1}{4}$ of $\frac{3}{5}=\frac{3}{20}$ and these reduced to a common denom. $=14\times20=280$, $3\times48=144$ } numer.
And $48\times20=960$ the common denom.
Therefore $\frac{280}{960}-\frac{144}{960}=\frac{136}{960}=\frac{17}{120}$. Ans.

DIVISION OF VULGAR FRACTIONS.

EXAMPLES.

(2) $\frac{5}{9}$ by $\frac{3}{1}$ thus $\frac{1}{3})\frac{5}{9}(\frac{5}{27}$. Ans.

(3) $6\frac{2}{3}=\frac{3}{5}^{3}\div\frac{1}{3}$ thus $\frac{3}{1})\frac{3}{5}^{3}(\frac{9}{5}^{9}=19\frac{4}{5}$. Ans.

(4) Thus $\frac{2}{3}$ of $\frac{3}{4}=\frac{6}{12}$ and $\frac{1}{2}$ of $\frac{2}{3}=\frac{2}{6}$.
Then $\frac{6}{12}\div\frac{2}{6}$ thus $\frac{6}{2})\frac{6}{12}(\frac{36}{24}=1\frac{1}{2}$. Ans.

(5) $\frac{1}{6}$ by $\frac{3}{4}$ thus $\frac{4}{3})\frac{1}{6}(\frac{4}{18}=\frac{2}{9}$. Ans.

(6) $\frac{2}{3}$ of $\frac{7}{8}=\frac{14}{24}$ and $\frac{1}{7}$ of $\frac{1}{4}=\frac{1}{28}$.
Then $\frac{14}{24}$ by $\frac{1}{28}$ thus $\frac{28}{1})\frac{14}{24}(\frac{392}{24}=16\frac{1}{3}$. Ans.

(7) $\frac{1}{2}$ of $17\frac{1}{2}=\frac{1}{2}$ of $\frac{35}{2}=\frac{35}{4}$.
Then $\frac{35}{4}\div\frac{3}{4}$ thus $\frac{4}{3})\frac{35}{4}(\frac{140}{12}=11\frac{2}{3}$. Ans.

(8) Thus $\frac{3}{4}$ of $91\frac{78}{97}=\frac{3}{4}$ of $\frac{8905}{97}=\frac{267715}{388}$.
And $\frac{267715}{388}\div\frac{10936}{50}$ thus $\frac{50}{10936})\frac{267715}{388}(\frac{13357750}{4019688}=3\frac{649223}{2009844}$
Ans.

RULE OF THREE IN VULGAR FRACTIONS.

EXAMPLES.

(2) Thus $3\frac{1}{4}yds.=\frac{13}{4}$ and $9\frac{3}{4}s.=\frac{39}{4}$ and $4\frac{3}{4}yds.=\frac{19}{4}$.
Then we have $\frac{13}{4}:\frac{39}{4}::\frac{19}{4}:14s.\ 3d.$
For $\frac{39}{4}\times\frac{19}{4}=\frac{741}{16}s.\div\frac{4}{13}=\frac{29664}{208}=14s.\ 3d.$ Ans.

(3) Thus $\frac{5}{4}:\frac{20}{1}::\frac{3}{4}:12yds.$
For $\frac{20}{1}\times\frac{3}{4}=\frac{60}{4}\div\frac{4}{5}=\frac{240}{20}yd.=12yds.$ Ans.

(4) Thus $27\frac{3}{4}\times4pe.=111yds.$ and $15\frac{3}{5}s.=15s.\ 8d.$
Then say as in whole numbers, $1yd.:111yds::15s.\ 8d.:$ £86 19s.
For $15s.\ 8d.=188d.\times111yds.=20868d.$ which $\div12\div20=$£86 19s. Ans.

(5) Thus $5\frac{3}{7}cwt.=\frac{38}{7}$ and £$31\frac{14}{32}=\frac{1006}{32}$.
Then we have $\frac{38}{7}:\frac{2}{5}::\frac{1006}{32}:$ £2 6s. $3\frac{18}{19}d.$
For $\frac{1006}{32}\times\frac{2}{5}=\frac{2012}{160}\div\frac{7}{38}=\frac{140084}{6080}$ £.$=$£2 6s. $3\frac{18}{19}d.$
Ans.

(6) First $1\frac{2}{5}lb.=\frac{8}{5}$.
Then $\frac{1}{3}lb.:\frac{8}{5}lb.::\frac{4}{7}dol.:$ $2 $74\frac{2}{7}cts.$
For $\frac{8}{5}\times\frac{4}{7}=\frac{32}{35}\div\frac{3}{1}=\frac{96}{35}dol.=$$2 $74\frac{2}{7}cts.$ Ans.

(7) Thus $20\frac{2}{3}d.=\frac{62}{3}$.
Then inversely thus $6m.:10m.::\frac{62}{3}day.:34\frac{4}{5}days.$
For $\frac{62}{3}\times\frac{10}{1}=\frac{620}{3}\div\frac{1}{6}=\frac{6200}{18}=34\frac{4}{5}days.$ Ans.

(8) First $\frac{1}{3}$ of $2\frac{1}{2}cwt.=\frac{1}{3}$ of $\frac{5}{2}=\frac{5}{6}$ of a *cwt.*
Then this reduced to *lbs.* would be $\frac{5}{6}$ of $\frac{112}{1}=\frac{560}{6}$.
Then we have $6\frac{1}{2}lbs.=\frac{13}{2}:\frac{560}{6}::\frac{3}{4}:$ $10 $76\frac{12}{13}cts.$
For $\frac{560}{6}\times\frac{3}{4}=\frac{1680}{24}\div\frac{2}{13}=\frac{33360}{312}dol.=$$10 $76\frac{12}{13}cts.$

DECIMAL FRACTIONS.

ADDITION OF DECIMALS.

EXAMPLES.

(5)	56.12	(6)	361.04
	.7		.120
	1.314		78.0006
	5837.01		101.54
	.15		8.943
			.3
Ans.	5895.294		
		Ans.	549.9436

MULTIPLICATION OF DECIMALS.

EXAMPLES.

(2)	54.20	(3)	4560.
	38.63		.3720
	16260		91200
	32520		31920
	43360		13680
	16260		
		Ans.	1696.3200
Ans.	2093.7460		

(4) .28043
.0005

Ans. .000140215

SUBTRACTION OF DECIMALS.

EXAMPLES.

(5) 13.16421
4.286

Ans. 8.87821

(6) 5960.
.3742

Ans. 5979.6258

DIVISION OF DECIMALS.

EXAMPLES.

(2) 4.20)148.63(35.304+ Ans.
1263

2233
2105

1280
1263

1700
1684

16 rem.

(3) 3.2).2142(.066+ Ans.
192

222
192

30 rem.

(4) 931.)2.00385(.0021523+ Ans.
1862

1418
931

4875
4655

2200
1862

3380
2793

587 rem.

REDUCTION OF DECIMALS.

CASE 1.

(2) 8)7.000

.875 Ans.

(3) 24)170(.70833+
168

200
192

80
72

80
72

8 rem

(4) 2162.)3810(.1762+ Ans.

2162	
16480	
15134	
13460	
12972	
4880	
4324	
556	rem.

(5) 254)1160(.4566+ Ans.

1016	
1440	
1270	
1700	
1524	
1760	
1524	
236	rem.

CASE 2.

(2) Thus 2*R*. 4*P*.=84*P*. 1*A*.=160*P*.

Then 160)840(.525 Ans.

800

400
320

800
800

(3) 2*qr*. 2*na*.=10*na*. And 1*yd*.=16*na*.

Then 16)100(.625. Ans.

96

40
32

80
80

(4) 1*hr.*=60*min.* And 60)5.00(.08333+ Ans.
480
200
180
200
180
200
180
20 rem.

(5) 1*oz.*=480*grs.* Then 480)1000(.02083+ Ans.
960
4000
3840
1600
1440
160 rem.

(6) 2*qts.* 1*pt.*=5*pts.*
1*hhd.*=504*pts.* Then 504)5000(.00992+ Ans.
4536
4640
4536
1040
1008
32 rem.

CASE 3.

(2) £. .1361
20
s.2.7220
12
d.8.6640
4
qr.2.6560
Ans. 2s. 8½d.

(3) Day. .235
24
940
470
hrs.5.640
60
min.38.400
60
sec.24.000 Ans. 5h. 38m. 24sec.

(4) Gal. .424
4
qt.1.680
2
pt.1.360 Ans. 1qt. 1.36pt.

(5) s. .253
12
d.3.036 Ans. 3.036d.

(6) Yd. .436
4
qr.1.744
4
na.2.976 Ans. 1qr. 2na.

(7) Acre. .9
4
r.3.6
40
p.24.0 Ans. 3R. 24P.

RULE OF THREE IN DECIMALS.

EXAMPLES.

(2) Thus 1.4*yd.* : 15.*yd.* :: 13*s.* : £6 19*s.* 3*d.* 1.71*qr.*
For 13×15=195. the dividend.
Then 195.÷1.4=£6 19*s.* 3¼.71*qr.* Ans.

(3) Thus 1*qr.* : 1*yd.* :: $2 34.5*cts.* : $9 38*cts.*
For 2. 34.5×4=$9 38*cts.* Ans.

(4) First sold it for $108.30*cts.*
but paid for it 84.39.12—

gained on it $23.90.88

Then 10.5*cwt.* : 1*cwt.* :: $23 90*cts.* 88 : $2 27*cts.* 7*m.*+
For 23 .90 88÷10.5=$2 27*cts.* 7*m.* Ans.

(5) Thus $20.8 : $12.6 :: 240*pie.* : 145.38*pie.*+
For 240×12.6=3024.0 which ÷ 20.8=145.38*pie.*+ Ans.

(6) Thus 3.5*oz.* : 5.2*oz.* :: 74.6*cts.* : $1 10*cts.* 8*m.*
For 5.2×74.6÷3.5=$1 10*cts.* 8*m.* Ans.

POSITION.

SINGLE POSITION.

EXAMPLES.

(2) Suppose 162 in the box.

	$
⅕	32.40=⅕
1/6	27.00=1/6
⅛	20.25=⅛
1/12	13.50=1/12
Result	93.15

Then $93 15*cts.* : $162 :: $500 : $1200. Ans.

(3) Suppose C.'s 40
+8
48=B.'s
+16
64=A.'s
48=B.'s
40=C.'s
152 result.

Then 152*yrs.* : { 64 :: 133 : 56=A.'s
48 :: 133 : 42=B.'s
40 :: 133 : 35=C.'s } Ans.

133 proof.

(4) Suppose No. 3 cost £20
3
60=No. 2.
2
120=No. 1.
60
20
Result 200

Then 200 : { £120 :: £350 : £210=No. 1.
60 :: 350 : 105=No. 2.
20 :: 350 : 35=No. 3. } Ans.

(5) Suppose *Yrs.* 60
2
120
3
5)360
3)72
24 result.

Then 24*yrs.* : 60*yrs.* :: 14*yrs.* : 35*yrs.* Ans.

(6) Thus suppose £. 40
$5\frac{3}{4}$
200
20
10
Int. for 1*yr.* £. 2|30
20
s. 6|00

Then as £10 14s. 8*d.* : £201 5s. :: £40 : £750. *A*

£. s.
And $|\frac{1}{4}|$2 6
4 years.
Int. in 4 yrs. 9 4
Int. for 8 mo. $|\frac{1}{2}|$1 3
0 7 8
Whole int. 10 14 8

N

(7) Thus, suppose the cistern to hold 100 gallons.
Then $100 \div 45min. = 2\frac{2}{9}gal.$ = the quantity which the first cock discharges in a minute.
And $100 \div 55min. = 1\frac{9}{11}gal.$ the quantity which the second cock discharges in $1min.$
Then $100 \div 30min. = 3\frac{1}{3}gal.$ = the quantity which the discharging cock discharges in $1min.$ Consequently, $2\frac{2}{9}gal. + 1\frac{9}{11}gal. = 4\frac{4}{99}gal.$ the quantity which the cistern receives by both the first and second cocks in a minute. Then as $3\frac{1}{3}gals.$ run out in the same time, $4\frac{4}{99}gal. - 3\frac{1}{3}gal. = \frac{70}{99}gal.$ that the cistern gains in $1min.$
Then $\frac{70}{99}gal. : 100gal. :: 1min. : 2hrs.\ 21min.\ 25\frac{5}{7}sec.$ Ans.

DOUBLE POSITION.

(2) First suppose they received $ 276
2
3)552
184 = what A. spent.
+250
434 = what B. spent.
−276
158 B. was in debt every 7 year.
1106 = 7 years' debt.
−350
756 error too much.

Again suppose the salary was

$
300
2

3)600

200=A. spent.
+250

450 B. spent.
—300

B. was every year 150 in debt.
7

And in 7 years he was 1050 in debt.
—350

700 error too much.

Then 756×300=226800
700×276=193200
Difference of errors —56)33600($600 the salary, $\frac{2}{3}$
336 of which=400
A.'s share, then
00 600—400=200
B.'s share. Ans.

(3) First suppose 30 working days.

$30
—10 that he forfeits.

Receives 20
27 50

7 50 error too little.

Again suppose 20 working days.

1

$20
Forfeits 15

Receives 5
27 50

22 50 error too little.

Then 2250×30=67500
750×20=15000

Difference of errors 1500)52500(35 working days
4500

7500
7500

Therefore 50—35=15 idle days. Ans.

(4) First suppose 10 cows=$160
And 10 oxen=240
40 calves=240

The whole 640
—320

320 error too much.

Again suppose 8 cows=$128
And 8 oxen=192
And 32 calves=192

The whole 512
320

192 error too much.

Then 320×8=2560
192×10=1920

Difference of errors 128)640(*5cows 5oxen* & 20
640 *calves.* Ans.

(5) First suppose

	Ft.
No. 2=	20
	10=½
	15
	25=No. 3.
	+15
	40
	—20
	20 error too much.

Again suppose

	Ft.
No. 2=	30
	15=½
	15
	30=No. 3.
	+15
	45=No. 2.
	—30
	15 error too much.

Then 20×30=600
15=20=300

Difference of errors 5)300

60=No. 2, then 60—15=45=No. 3.

And then we have No. 1=15, No. 2=60, and No. 3=35, which added together=120*ft.* the length of the pole. Ans.

(6) Thus first suppose the whole property to have bee worth £.

		£.
396		
—	Again suppose	432
198=½		—
—40		216=½
—		—40
158=A.'s share.		—
—		176=A.'s
132=⅓		—
+12		144=⅓
—		+12
144=B.'s share.		—
—80		156=B.'s
—		—80
60=C.'s share.		—
144		76=C.'s
158		156
—		176
366 sum.		—
396		408 sum.
—		432
30 error of defect.		—
—		24 error of defect
		—

Then 432×30=12960
396×24= 9504

Difference of errors 6)3456

£576 Ans.

£.
Then 576÷2—40=248 A.'s share.
204÷3+12=204 B.'s do.
204—80=124 C.'s do.

£576 proof.

(7) First suppose each boy received

£.
3
2
—
6=share of each woman.
3
—
18=share of each man.
—

£.
And 19×3=57
11×6=66
7×18=126
—
249
172 19 4¼
—
76 0 7¾ error of exce
—

Again suppose each boy received

£.
1
2
—
2 share of each woman.
3
—
6 share of each man.
—

£.
And 19×1=19
11×2=22
7×6=42
—
83
172 19 4¼
—
89 19 4¼ error of defect
—

	£.	s.	d.			
Now	89	19	$4\frac{1}{4}\times3=$	269	18	$0\frac{3}{4}$
	76	0	$7\frac{3}{4}\times1=$	76	0	$7\frac{3}{4}$
				345	18	$8\frac{1}{2}$

Which $\div 166$ sum of errors = £2 1*s.* 8*d.*+ = each boy's share, which $\times 2$ = £4 3*s.* $4\frac{1}{2}$*d.*+ = each woman's share, which $\times 3$ = £12 10*s.* $0\frac{3}{4}$*d.*+ = each man's share. Ans.

INVOLUTION, OR THE RAISING OF POWERS.

EXAMPLES.

(2) $14\times14\times14=2744$. Ans.

(3) $2.8\times2.8\times2.8\times2.8\times2.8\times2.8=481.890304$. Ans.

(4) $.263\times.263\times.263=.018191447$. Ans.

(5) $\frac{1}{4}\times\frac{1}{4}\times\frac{1}{4}\times\frac{1}{4}\times\frac{1}{4}\times\frac{1}{4}\times\frac{1}{4}=\frac{1}{65536}$. Ans.

(6) $401\times401\times401\times401=25856961601$. Ans.

EVOLUTION, OR THE EXTRACTING OF ROOTS.

SQUARE ROOT.

EXAMPLES.

(2) 39375655(6275 Ans.

36

122)337

244

1247)9356

8729

12545)62755

62725

Rem. 30

(3) 1486.179010(38.55. Ans.

9

68)586

544

765)4217

3825

7705)39290

38525

Rem. 76510

(4) 96385163(9817 Ans.

81

188)1538
1504

1961)3451
1961

19627)149063
137389

Rem. 11674

(5) .0001324960(.01151 Ans.

1

21)32
21

225)1149
1125

2301)2460
2301

Rem. 159

(6) 18.362147(4.285 Ans.

16

82)236
164

848)7221
6784

8565)43747
42825

Rem. 922

(7) $\frac{2450}{3200}=\frac{49}{64}$ whose square root is $\frac{7}{8}$. Ans.

(8) $36)\frac{1296}{1764}=\frac{36}{49}$ whose square root is $\frac{6}{7}$. Ans.

(9) 500)3200(√64(8 Ans.
3000 64
2000
2000

(10) $50\times64+49=3249$.
Then $\sqrt{3249}(\frac{57}{8}=7\frac{1}{8}$. Ans.
25
107).749
749

And √64(8 denominator.
64

(11) $30\times100+25=30.25$
Then $\sqrt{30.25}(5.5=5\frac{5}{10}$. Ans.
25
105)525
525

(12) 1296(36 Ans.
3×3=9
66)396
396

(13) 169(13 Ans.
1
23)69
69

(14) 3097600(1760*yds.*=1*mile*.
1 Ans.
27)209
189
346)2076
2076
00

(15) Thus $15\times15=225$
$24\times24=576$

$\sqrt{801}(28.3$ Ans.
4

48)401
384

563)1700
1689

Rem. 11

(16) $212\times212=44944$ *ft.*
And 20 *yds.* $=60\times60=3600$ *ft.*

41344(203.332 *ft.* Ans.
$2\times2=4$

403)1344
1209

4063)13500
12189

40663)131100
121989

406662)911100
813324

Rem. 97776

(7) Thus $4)\frac{208}{1036}=\frac{52}{259}$ which reduced to a decimal= .20007722+

Then .200077220(.584 Ans.
125

Defec. divi. & squ. of 8=7564)75077
+200=complete divisor=8764)70112

Defec. div. & sq. of 4=1009216)4965220
+6960=com. divisor=1016176)4064704

Rem. 900516

(8) Thus $\sqrt[3]{36.\frac{26}{30}}=\sqrt[3]{36.866666}+$(3.82 Ans.
3×3×3=27

Defec. div. & sq. of 3=2709)9866
+270=complete divi.=2979)8937

Defec. div. & sq. of 2=326704)929666
+198=com. divisor=328684)657368

Rem. 272298

ALLIGATION.

CASE 1.

(2)

	Cwt.	$ *cts.*	$ *cts.*
	2 at	25	= 50 00
	4 at	20 50	= 82 00
	7 at	18 62½	=130 37½
	13		$262 37½ sum.

Then as 13cwt. : 1*cwt.* :: $262 37½*cts.* : $20 18¼*cts. Ans.*

CASE 2.

(2) Mean rate 50

cts.		
34	=36 at	34 cts.
42	=60 at	42 cts.
86	=16 at	86 cts.
110	= 8 at	110 cts.

} Ans.

CASE. 3.

(2) Mean rate 92

cts.	
75	= 2
86	=13
94	=17
105	= 6

lbs.

Then 2 : 6 :: 13 : 39 at 86 cts.
2 : 6 :: 17 : 51 at 94 cts.
2 : 6 :: 6 : 18 at 105 cts.
} Ans.

CASE 4.

(2) Mean rate 145

cts.		
130	=15+35	=50
160	=	15
180	=	15
		80 sum of differ.

Then as 80 : 50 :: 32 : 20 at 130 cts.
80 : 15 :: 32 : 6 at 160 cts.
80 : 15 :: 32 : 6 at 180 cts.
} Ans.

ARITHMETICAL PROGRESSION.

CASE 1.

EXAMPLES.

2) Thus 40—1=39 (3) 10—1=9

2 com. dif.	4 com. dif.
78	36
2=1st term.	+10=1st term.
80	46 last term.
2=1st term.	+10
82 sum.	56 1st Ans.
40	10
2)3280	2)560
$1640 Ans.	280 2d Ans.

(4) 75—1=74

2 common difference.

148

+6=1st term.

$1.54 for the last. 1st Ans.

6=1st term.

160 sum.

75

800

1120

2)12000

$60 00 in the whole. Ans.

CASE. 2.

(2) Thus 175
—21

8—1=7)154

22 common difference.

And 175+21=196 sum of extremes.
8 number of terms.

2)1568

784 whole sum.

Lastly 21+22= 43=2d payment.
43+22= 65=3d
65+22= 87=4th
87+22=109=5th
109+22=131=6th
131+22=153=7th
153+22=175=8th

763
21=1st payment.

784 proof.

(3) Thus 49
—4

10—1=9)45

5 common difference.

Then 49+4=53 sum of extremes.
10 number of terms.

2)530

Received £265 Ans.

GEOMETRICAL PROGRESSION.

EXAMPLES.

(2) Thus power 1 2 3 4
Ratio 3 9 27 81

27 3d power.

567
162

2187=7th power.
5=1st term.

10935=last term.
3 ratio.

32805
—5=1st term.

Ratio less 1=2)32800

£16400 Ans.

(3) Thus

power 1	2	3	4	5	6	7	8	9
Ratio 2—	4—	8—	16—	32—	64—	128—	256—	512

512
1024
512
2560
262144=18th p.
4=2d do.
1048576=20th p.
1 1st term.
1048576=last t.
2 ratio.
2097152
1=1st t.

Ratio less 1=1)2097151

Ans. $20971|51 *cts.*

COMPOUND INTEREST BY DECIMALS.

EXAMPLES.

(2) Thus, tabular number 1.2155062

750

607753100
85085434
911.6296500

Amount of £1 for 6*mo.* 1.024695 from Ex. 2.

45581482500
82046668500
54697779000
36465186000
18232593000
91162965000

£934.1423442067500

20

s.2.8468841350000

12.

d.10.162609620000

	£	s.	d.	
Amount	934	2	10+	
Principal	750	0	0	
Interest	184	2	10+	Ans.

CASE 2.

(1) Thus £695 13*s.* 9*d.*=695.6875£.
Then from tab. II. 1.2762815)695.68750(545£. 1*s.* 9*d.*+ Ans.

(2) Thus £260 5*s.* 3*d.*=260.2625£ which÷by 1.191016 from table II.=£218 10*s.* 5*d.*+ Ans.

ANNUITIES AT COMPOUND INTEREST.

CASE 1.

(2) The number from table III.=5.637093
200=annuity.

Amount for yearly payments=1127.4186 which × 1.014781 proper number for ½ yearly payment from table V.=$1144 08 2*m.*+ Ans.

CASE. 2.

(2) Thus, the num. from tab. IV.=4.21236
£70 annuity.

$294 86 52 Ans. for y. payments.

Then $294.8652×1.014781 from table V.= $299.22.3+*mills.* Ans. for ½ yearly payments.
And 294.8652×1.022257 for quarterly payments from the same table=$301.42.8+*mills.* Ans. for *quarterly* payments.

ANNUITIES IN REVERSION.

(2) Thus 9+4=13*yrs.*=9.98565 table IV.
4 do.=3.62989—

6.35576
120

1271152
635576

$762.69.1.2*m.* Ans.

PERPETUITIES AT COMPOUND INTEREST.

(2) Thus, ratio—1=1.06—1=.06)260.00

$4333.33.3*m.*+ Ans.

COMBINATION.

EXAMPLES.

(2) Thus $20\times19\times18\times17\times16\times15\times14\times13\times12\times1=$
$1\times2\times3\times4\times5\times6\times7\times8\times9\times10=$

$$\frac{670442572800}{3628800}=184756 \text{ Ans.}$$

PERMUTATION.

EXAMPLES.

(3) Thus $1\times2\times3\times4\times5\times6\times7\times8\times9\times10\times11\times12=$
479001600 number of changes.
15 seconds.

2395008000
479001600

6|0)7185024000 sec.

6|0)11975040|0 min.

365¼ d. = 8766 hrs.)1995840(227 yrs. 248 days. 6 hrs.
Ans.

DUODECIMALS.

ADDITION OF DUODECIMALS.

EXAMPLES.

	Ft.	*in.*	″	‴	⁗		*Ft.*	*in.*	″	‴	⁗
(1)	10	5	6	11	6	(2)	37	8	10	6	9
	15	9	5	2	10		43	11	2	4	7
	18	4	1	7	9		19	7	5	3	8
	12	8	6	5	7		18	4	1	7	2
Ans.	57	3	8	3	8	Ans.	119	7	7	10	2

	Ft.	*in.*	″
(3)	16	8	0
	14	6	0
	17	9	2
Ans.	48	11	2

SUBTRACTION OF DUODECIMALS.

EXAMPLES.

		Ft.	*in.*	″	‴	⁗
(1)	From	38	8	4	7	5
	Take	15	11	6	9	3
	Ans.	22	8	10	2	2

		Ft.	*in.*	″	‴	⁗
(2)	From	720	3	8	1	6
	Take	13	9	4	7	10
	Ans.	706	6	3	5	8

		Ft.	*in.*	″	‴	⁗
(3)	From	475	7	2	0	0
	Take	81	2	5	10	6
	Ans.	394	4	8	1	6

MULTIPLICATION OF DUODECIMALS.

CASE 1.

EXAMPLES.

		Ft.	*in.*	″
(2)		54	10	
			5	7
		31	11	10
		274	2	
	Ans.	306	1	10

		Ft.	*in.*	″
(3)		6	9	3
			3	5
		2	9	10 3
		20	3	9
	Ans.	23	1	7 3

CASE 2.

(2)

in.		*Ft.*	*in.*	″		
6	$\frac{1}{2}$	81	10	4		
				7×2=14		
		573	0	4		
				2		
		1146	0	8		
1	$\frac{1}{6}$	40	11	2		
″		6	9	10	4	
4	$\frac{1}{3}$	2	3	3	5	4
1	$\frac{1}{4}$	0	6	9	10	4
	9)	1196	7	9	7	8
	Ans.	132	11	6	4	11

(3)

in.		*Ft.*	*in.*	″	‴				
4	$\frac{1}{3}$	2	5	7	2				
	$\frac{1}{4}$	0	9	10	4	8			
3	$\frac{1}{4}$		2	5	7	2			
6‴	$\frac{1}{6}$			7	4	9	6		
4‴	$\frac{1}{18}$			1	2	9	7		
1	$\frac{1}{4}$					9	10	4	8
						2	5	7	2
		1	1	0	8	5	4	11	10 contents of 1 sh.
									10×10×10=1000
		10	10	7	0	6	1	10	4
									10
		108	9	10	5	1	6	7	4
									10
sq. ft.		1088	2	8	3	3	6	1	4 Ans.

PROMISCUOUS EXAMPLES.

(1) Thus A.'s 25 years.
+15

B.'s 40 years.
+12

C.'s 52 years. Ans.

(2)

	$	cts.		$	cts.	
Thus	220	50 ÷ 5 =		44	10	A.'s own share.
	220	50 ÷ 6 =		36	75	B.'s do.
				80	85	sum.
				220	50	
				139	65	= C.'s own share.

	$	cts.		$	cts.	m.	
Then	36	75 ÷ 2 =		18	37	5	= ½ B.'s share.
				44	10		
				62	47	5	= A.'s last share.

	$	cts.	m.
And	18	37	5
	139	65	
Ans.	158	02	5 = C.'s last share.

(3) $100 — $7½ : $100 :: $56 25*cts.* : $60 81*cts.* 5*m.* +25.
For 5625 × 100 = 562500 the dividend.
And 100 — 7½ = 92½ the divisor.
Then 562500 ÷ 92½ = $60 81*cts.* 5*m.* +25. Ans.

(4) Thus B. gains 2 miles per hour.
Then as 2*m.* : 50*m.* :: 1*hr.* : 25*hrs.* 1st Ans.
Now as B. went at the rate of 10 miles per hour for 25 hours, 10 × 25 = 250 miles, the 2d Ans.

(5) Thus $\frac{5}{20}=\frac{1}{4}$)750

187 50 whole price of the damaged.
100 loss.

87 50 what it sold for.

Then $1 25*cts.* : $87 50*cts.* :: 1*yd.* : 70*yds.*=quantity damaged.
And 70×4=280*yds.* the whole quantity.
70

210 undamaged.

And $750 00*cts.* cost.
87 50 received for the damaged.

210*yds.* : $662 50 :: 1 : $3 15¼*cts.*+ Ans.

(6) Thus 1000—1=999 number of terms—1.
1 ft. common difference.

999
2 ft. first term.

1001 last term.
2

1003 sum of the terms.
1000

2)1003000

3)501500 ft.

220)167166+2 ft.

8)759+186 yds.

94+7*fur.* 186yds. 2ft. Ans.

(7) Thus admit the wall to contain 3600 feet.

Then 20)3600(180 feet raised in a day by A. B. & C.
24)3600(150 B. C. & D.
30)3600(120 C. D. & A.
36)3600(100 A. B. & D.

3)550

$183\frac{1}{3}$ feet per day by altogether.

Then	$183\frac{1}{3}$	And	$183\frac{1}{3}$
B. C. & D.	150	C. D. & A.	120
A.	$33\frac{1}{3}$	B.	$63\frac{1}{3}$
And	$183\frac{1}{3}$	And	$183\frac{1}{3}$
A. B. & D.	100	A. B. & C.	180
C.	$83\frac{1}{3}$	D.	$3\frac{1}{3}$

days.

Then, feet per day by A, $33\frac{1}{3}$)3600(108 for A. to do it in.
do. by B. $63\frac{1}{3}$)3600($56\frac{16}{19}$ B. do.
do. by C. $83\frac{1}{3}$)3600($43\frac{1}{5}$ C. do.
do. by D. $3\frac{1}{3}$)3600(1080 D. do.
And $183\frac{1}{3}$)3600($19\frac{7}{11}$ days all working together. Ans.

(8) Thus 4 crowns at

	d.	*d.*
146 each		=584
3 dolls.	108	=324
2 ducats	136	=272
		1180*d.* sum.

And £1055 15*s.*=253380*d.*

Then
1180 : 253380 :: { 584 : 125402÷146=$858\frac{4}{7}$ *cr.*
324 : 69572÷108=$644\frac{8}{27}$ *s.*
272 : 58406÷136=$429\frac{31}{68}$ *duc.* }

Ans.

(9) **Thus** 9*m.* : 21*m.* :: $332 50*cts.* : $775 83½*cts.* **Ans.**
For 33250×21=698250 **the dividend.**
And 9=**the divisor.**
Then 698250÷9=$775 83⅓*cts.*

(10) Thus 12
4

16*yrs.*=10.83777 Table IV.
Time of reversion 12 = 8.86325 do.

1.97452 difference.
72025 annuity.

987260
394904
3949040
1382164

$1422.1480300

Or $1422 14*cts.* 8*m.*+ Ans.

	$	*cts.*	
(11) 3150 gigs÷7×5=2250 wagons which×6*cts.*=	135	00	for the wagons.
3150 gigs÷3×5=5250 footmen which×1*ct.*=	52	50	for footmen.
5250 foot.÷6×4=3500 horsemen wh.×2*cts.*=	70	00	for horsemen.
3150 gigs at 4*cts* per gig=	126	00	for gigs.
Amount of toll	383	50	Ans.

(12) Thus 15*gals.* in 3*min.*=5*gals.* per min. that runs in.
And 20÷5=4*gals.* that run out in a min. Consequently, the gain is 5—4=1*gal.* per min. which is 60*gal.* per hour.
Then 110—60=50gals. yet to run in.
Then 5*gals.* : 50gals. :: 1min. : 10min. Ans.

(13) Thus 264
6

mo.			
6	½	15 84	Int. for 1 year.
3	½	7 92	
		3 96	
		11 88	Int. for 9 months.
		264 00	
		30 00	profit.
		$305 88	for the whole.

Then 28*cwt.*=3136)30588(0 9 7+ Ans.
28224

23640
21952

Rem. 1688

(14) Thus, the proportions are A. 4 B. 5 C. 3=12.

	$		
Then 12 : 780 :: 4 :	260	A.'s share of profit	1st Ans.
5 :	325	B.'s do.	
3 :	195	C.'s do.	
	$780	proof.	

	$	*mo.*
Then	260	×5=1300
	325	×7=2275
	195	×9=1755
		5330

Again $330 : 5762 :: { 1300 : 1405 36 A.'s stock. / 2275 : 2459 39 B.'s / 1755 : 1897 25 C.'s

$5762 00 proof.

Now 2459 39
2087 00 B. received.

372 39 B.'s loss of stock.
And 325 00 do. of gain.

Ans. $697 39 A. & C. would gain.

(15) $100+5\frac{3}{4}=105\ 75$.

Then 105 75 : 100 :: 1000 : $ cts. m.
945 62 6 cost C.
20 75 0 less.

$924 87 6 cost B.

Again 100
—5 50

94 50 : 100 :: $924 87*cts.* 6*m.* : $978 70*cts.* 4*m.* that the whole cost A. which ÷ 20*hhds.*=$48 93*cts.* 5*m.*+ per *hhd.* Ans.

(16) 10×11=110 sold for.
10× 7= 70 worth.

$40 gain of A.

	$	cts.	m.			$	cts.
And 100÷3=36	66	6+		paid cash.		5	25
110	00	0				4	50
	$73	33	3	to pay in paper.		$0	75 B. gains.

Then 450 : 75 :: 73 33 3 : $12 22cts. 2m. gain of A. Ans.

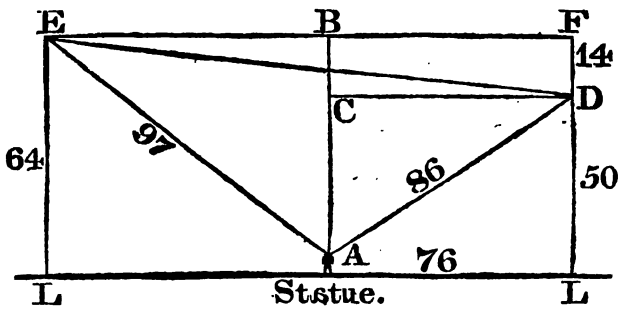
(17) Thus 21—14=7 years to be of age.

$

Then 1300
6
7800 int. first year.
1300
1278 amount—100.
6
7668 int. second year.
1278
125468 amount—100.
6
752808 int. third year.
125468
12299608 amount—100.
6
73797648 int. fourth year.
12299608
12037584 amount—100.
6
72225504 int. fifth year.
12037584
11759839 amount—100.
6
70559034 int. sixth year.
11759839
11465429 amount—100.
6
68792574 int. seventh year.
11465429

$1115.33.54m. amount—100. Ans.

(18)



Thus, referring to the above figure.

A B is a perpendicular line erected on the centre of the statue's base, which forms the side A C of the right angle A C D and the other two sides, A D 86 & C D 76 are given to find the length of the side A C.

Now $76^2=5776$ & $86^2=7396$

-5776

$\sqrt[2]{1620}$ diff.$(40.2+$ $=$A C

Then $40.2+14$ the difference between the columns $=54.2$ the whole length of A B. Then $54.2^2=2937.64$ & $97^2=$

that is A E$=9409$

-2937.64

$\sqrt[2]{6471.36}=(80.44+$ for E B

$+76$ that is B F

$156.44=$E B F

14=D F	156.44
14	62576
56	62576
14	93864
196	78220
	15644
	24473.4736
	196

$\sqrt[2]{24669.4736}=157$ ft. Ans.

1*sec.* : 47*sec.* :: 1150*ft.* : 54050*ft.* Ans.

15*m.* 7*fur.*=83820*ft.*
Then 1150*ft.* : 83820*ft.* :: 1*sec.* : 1 *m.* $12\frac{10}{11}$*sec.* Ans.

First suppose $\frac{1}{2}$ of 8.2245 in. to be gold.

4.11225=$\frac{1}{2}$	4.11225 in. of sil.
10.36	5.85
2467350	2056125
1233675	3289800
4112250	2056125
42.6029100*oz.*g.	24.0566625*oz.* sil.
24.0566625	
66.6595725	
63	
3.6595725 error of excess.	

n suppose $\frac{1}{3}$ of 8.2245 in. to be gold, the rest silver.

2.7415=$\frac{1}{3}$	5.4830=silver.
10.36	5.85
164490	274150
82245	438640
274150	274150
28.401940 *oz.*	32.075550*oz. sil.*
32.075550	
60.477490	
63.	
2.522510 error of defect.	

[See following page.

Then 3.6595725×2.7415=10.03271800875
And 2.522510×4.11225=10.37319174750

And 2.522510+3.6595725=6.1820825)20.40590975625(3.3008148 inches of gold.
18.5462475

185966225
185462475

503750625
494566600

91840250
61820825

300194250
247283300

529109500
494566600

34542900 rem.

Then 3.3008148×10.36=34.196441328 ounces of gold, and the rest, which is 28.803558672 ounces silver. Ans.

(22) Thus 7*lbs.* beef at $5\frac{3}{4}$*cts.*$=40\frac{1}{4}$*cts.*
5 bread at 6 $=30$
Then $40\frac{1}{4}$*cts.* : $34 50*cts.* :: 30*cts.* : $25 71*cts.* 4*m.*+
Ans.

(23) Thus $\frac{4}{5}$ of $\frac{4}{7}$ of $\frac{362}{463}=\frac{7240}{29169}$.
Then $1-\frac{7240}{29169}=\frac{21929}{29169}$. Ans.

(24)

	$
	1000
	6
	60|00 int. for 1 year.
	8
	$480 int. for 8 years.

Then 8 years.
6 per cent.

48
100

148 amt. of $100 for 8 yrs. at 5 per cent.

$	$	$	$	*cts.*	*m.*	
Then 148 :	100 ::	1000 :	675	67	5	the present worth.
			1000	00	0	
			$324	32	5	discount.
			480	00	0	interest.
		Ans.	$155	67	5	difference.

(25) Thus $\sqrt[2]{32}=5.6568+$
$\sqrt[2]{24}=4.8989+$

10.5557 sum.
$\sqrt[3]{67}=4.15+$

Difference 6.40 Ans.

(26) Thus $100 : 105\frac{3}{5}$ :: $2450 : $2587 20*cts.* Ans.

(27) Thus the amount of $500 *75cts.* for 9 months at 6 per cent.=$533 28*cts.* 4*m.*

	cts.	$	*cts.*	
And 5064×2½=		126	60	price of the boards.
140×13=		18	20	do. tallow.
		144	80	amt.
		533	28	4
		$378	48	4 to receive in flax.

Then as 92½*cts.* : $378 48*cts.* 4*m.* :: 1*bu.* : 409$\frac{5}{9}\frac{9}{2}$*bu.* Ans.

(28) 9 yrs.=36 qrs. the sum of terms.
—1
35
3 common difference.
105
+6=1st term.
111 last term.
6=1st term.
117 sum.
×36 number of terms.
702
351
2)4212
$2106*cts.* due him. Ans.

(29) Thus 5*yrs.*—2$\frac{1}{4}$*yrs.*=2$\frac{3}{4}$*yrs.*
And the ratio at 6 per cent. involved to 2$\frac{3}{4}$*yrs.*=1.1867462)$2363 38*cts.* 75*m.*($1991 48*cts.* 5*m.* Ans.

(33) £100 : £120 :: £230 5*s.* £276 6*s.* the amount in sterling.

Then as £1 : £276 6*s.* :: $4 44*cts.* 4*m.* : $1227 87*cts.* 7*m.*+ Ans.

(34) Thus $\frac{87}{170}+\frac{1}{4}=\frac{518}{680}$, and $\frac{518}{680}$ subtracted from $1=\frac{162}{680}$=the 27 feet.

Then $\frac{162}{680}$: 27*ft.* :: 1 : 113*ft.* 4*in.* Ans.

(35) $7 : 56¼*cts.* :: $400 : $32 14⅔*cts.* Ans.

(36) Thus

30
+96
---
126 sum.
25 number of terms.

630
252
---
2)3150

$15|75 Ans.
---

(37) Thus 4 : 9 :: 47 : 105.75 the greater number.

47

152.75 sum.
58.75 difference.

76375
106925
122200
76375

Product 8974.0625 Ans.

THE END.